# Dissertation

zum Thema

# Restructuring international production networks – determinants and performance effects based on operational flexibility

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# LIST OF ABBREVIATIONS AND ACRONYMS

| | |
|---|---|
| ARCH | Autoregressive conditional heteroskedastic process |
| BERI | Business Environmental Risk Index |
| e. g. | Exempli gratia (for example) |
| FDI | Foreign direct investment |
| FGLS | Feasible generalized least squares |
| FSTS | Foreign sales / total sales |
| GDP | Gross domestic product |
| i. e. | Id est (that is) |
| i.i.d. | Independent and identically distributed |
| ILO | International Labour Organization |
| KILM | Key indicators of the labour market |
| Max | Maximum |
| Min | Minimum |
| MNC | Multinational corporation |
| NOC | Number of countries |
| Obs | Observations |
| R&D | Research and development |
| StdDev | Standard deviation |
| U.K. | United Kingdom |
| U.S. | United States |
| VIF | Variance inflation factor |
| vs. | versus |

| | |
|---|---|
| $F$ | Flexibility value |
| $N$ | Need |
| $NPV$ | Net present value |
| $O$ | Opportunity |
| t | Index of year |
| $V$ | Value of a production network |

| | |
|---|---|
| $\mu$ | Actual cost developments |
| $\sigma$ | Uncertainty of cost developments |

# 1. MOTIVATION AND STRUCTURE

International relocation of production to strengthen their competitive advantage has become a major strategic option for firms, and raises much attention in public debate as well as in academia (Sleuwaegen & Pennings, 2006). According to surveys of German firms, a temporary peak in international relocation was reached in the year of 2003, when every fourth firm was planning to invest in foreign production capacities (Kinkel & Maloca, 2009). The underlying motivations for relocating production abroad are manifold. First, a particular location may offer demand or supply markets that are attractive for foreign investors. In that sense, production subsidiaries might be established to meet local demand or to enable access to valuable production resources such as raw materials or low cost labor. Secondly, foreign production affiliates can be established in order to increase the efficiency of production processes across an integrated production system (Dunning & Lundan, 2008).

Rising international economic integration of firms' business activities reduces the importance of local production in order to serve demand on site (Mucchielli & Saucier, 1997). Further, convergence of customers' needs and the potential to modularize products favor internationally dispersed production processes that enable the most efficient allocation of products that are sold on the world market. However, the external cost conditions that determine efficient configuration of production activities are not fixed. For that reason, multinational corporations may build flexibility into their production configuration, allowing them to react to uncertain external developments (Buckley & Casson, 1998).

The concept of operational flexibility (Kogut, 1983) delivers a theoretical framework that encompasses the potential benefits of maintaining an international network of production subsidiaries in order to obtain the flexibility to manufacture on the most efficient scale. By shifting activities within that network in response to current cost developments, firms can exploit arbitrage and leverage opportunities (Kogut, 1985). To preserve efficient production processes, firms can adjust labor capacity across their production locations in accordance with their respective labor cost developments. However, the international production network has to exhibit a configuration that allows an efficient exploitation of operational flexibility. If the foreign locations within a production network show sub-optimal conditions for an internationally dispersed production process, the portfolio of production locations has to be reconfigured by adding new or withdrawing existing sites.

The goal of this study is to analyse the characteristics of the current configuration of an international production network that determine the need to expand or contract that network in order to provide operational flexibility. In addition to the question of a network's size, different qualitative characteristics of the portfolio's locations and the network as a whole are considered. Further, the study aims to clarify the issue of whether a network reconfiguration that improves the efficiency of a multinational production system leads to higher performance of a firm's international activities.

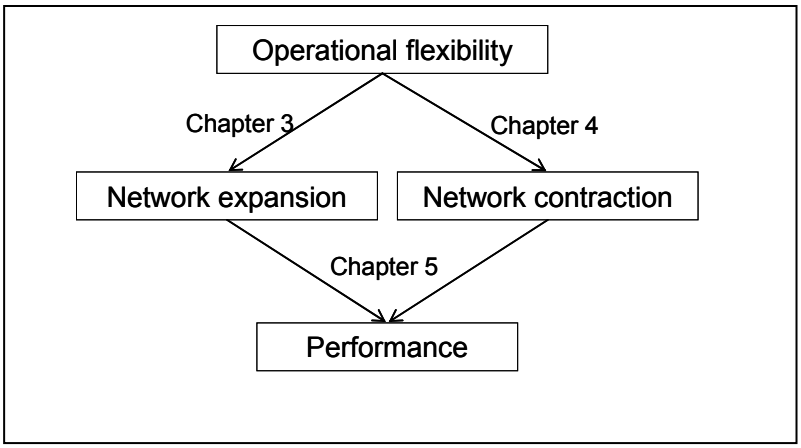
The remainder of the study is structured as follows. In the second chapter, we will introduce the concept of operational flexibility in detail and present extant empirical findings on the performance effects of maintaining operational flexibility, before we discuss which factors determine the flexibility potential of an international network of production subsidiaries.

In chapter three, we will analyse those characteristics of the existing international network of production subsidiaries that lead to a firm's decision to reconfigure the network by expanding it. The results of empirical analysis indicate that cost and flexibility shortcomings of the existing production network will increase the propensity to establish another production site abroad. Further, the findings suggest that investors choose locations for new production sites that will improve the efficiency of the network.

In the fourth chapter, we will investigate the factors influencing the propensity to withdraw from a location of the international production network as an alternative strategy for reconfiguring a production system. The empirical analysis reveals that firms tend to keep locations which show adverse cost developments if the location offers flexibility to react to those developments by shifting capacity. Adverse cost developments in the remaining countries of the network will deter investors from leaving the focal location.

Performance effects of reconfiguring an international production network are analysed in chapter five. Expanding or contracting a multinational network is expected to improve performance if it leads to a rise in the average ability to shift activities across locations. The empirical findings support this notion. Reconfiguration decisions that lead to a higher opportunity to adjust capacities as well as to lower the costs of capacity shifting will benefit firms in the short-run. Sub-analyses that consider only expanding or contracting decisions, respectively, further stress the importance of flexibility within international production networks. Figure 1.1 illustrates the structure of the empirical analysis.

Figure 1.1: Structure of the empirical analysis




The sixth and last chapter concludes the study by integrating its findings. Being aware of the study's limitations, we will indicate the implications for firms and governments as well as perspectives for future research.

# 2. INTERNATIONAL PRODUCTION NETWORKS

## 2.1 Traditional approaches on international production

There are several theoretical approaches that deliver alternative explanations of a firm's decision to invest in foreign production sites. A concept that attracts much attention in literature is the eclectic paradigm developed by John Dunning (e.g., Dunning, 1981). Drawing on the theory of monopolistic advantages (Hymer, 1976; Kindleberger, 1969), internalization theory (Buckley & Casson, 1976), and location factors, firms are supposed to invest in production subsidiaries abroad if they possess ownership-specific advantages, are better able to exploit them by themselves rather than using market mechanisms (internalization advantages), and if the foreign location offers favorable cost conditions (location-specific advantages). A dynamic approach to the decision to invest in foreign production sites is offered by the stage model put forward by Uppsala school (Johanson & Vahlne, 1977). It models the sequence of internationalization steps of a multinational corporation (MNC) via a learning process. According to the Uppsala approach, firms will invest in production subsidiaries abroad after they have gained experience in the particular market through previous investments in sales subsidiaries. Both concepts, however, view investments in foreign production affiliates as motivated by the intention to meet local demand. Therefore, these concepts are less suitable for analyzing the configuration of a multinational production network, which is established in order to generate efficiency in the overall production system.

Location factors are important determinants of an investor's decision to engage in production activities in a particular country. Literature stresses the absolute

advantages of individual locations, e. g. legal, political, or macroeconomic conditions, since they determine the attractiveness of a location as a destination for inward foreign direct investments (Enright, 2009; Flores & Aguilera, 2007). However, external conditions that determine a location's appropriateness as a production location are dynamic rather than fixed. Drawing on location factors at a given point of time neglects possible future developments that might lead to a different assessment of a location's qualities. Further, the evaluation of location factors also depends on characteristics of the individual parent firm and interrelations with other locations of a firm's portfolio. Location factors alone are therefore not sufficient to explain an MNC's efficient configuration of production activities.

A more comprehensive framework for explaining the determinants that influence an efficient configuration of a multinational production system is provided by the concept of operational flexibility. Departing from previous approaches, investments in foreign affiliates should be understood from the perspective of "sequential flows stemming from the advantages of flexibility of a multinational system" (Kogut, 1983).

## 2.2 International production from the perspective of operational flexibility

### 2.2.1 Concept of operational flexibility

Kogut (1983) criticizes theoretical approaches that stress national factors and market imperfections as motivation for foreign direct investment (FDI) and, instead, advocates viewing it as a process of sequential allocation decisions within a multinational network. Being internationally active, provides firms with the flexibility

to reduce the costs of operating in an uncertain world and is the primary advantage of MNCs as differentiated from national corporations in Kogut's view. The advantages of a multinational system can be subsumed under two categories: arbitrage and leverage opportunities (Kogut, 1985).

Arbitrage opportunities are given in the first place by the benefits of multinational production shifting. Firms may react to changed cost conditions of locally sourced inputs that are not priced at the world market – labor being probably the most important factor – by shifting production capacities across countries. Whereas labor costs may change themselves, national labor costs have to be judged differently due to exchange rate movements between countries. However, the benefits of shifting capacity have to be weighed against the costs in terms of loss in economies of scale in an individual plant and of holding excess capacity. Further, the degree to which labor costs are fixed or variable due to national layoff restrictions or overtime constraints has to be considered.

A second arbitrage opportunity is tax minimization within the MNC. Since countries exhibit different tax regimes, an MNC has the opportunity to minimize its tax bill through adjustment of transfer prices and choice of remittance channels. Being present in different countries allows the firm, e. g. by under- or over-evaluating internally transferred intangibles, to shift profits to subsidiaries in low tax countries. Thirdly, since countries often compete for inward FDI, firms can benefit from financial investment incentives such as subsidies, tax holidays, or guaranteed loans. Finally, firms may obtain advantages through their international presence in terms of information arbitrage. This information may concern matching sellers and buyers or finding innovations on product and process developments.

Leverage opportunities are offered by a higher bargaining power towards customers, competitors, and governments. Multinational firms may, for example, cross-subsidize their products internationally in order to carry out aggressive price cutting strategies in certain foreign markets or to counter political risks by relocating activities to other countries of a multinational network when negotiations with governments fail.

Benefiting from internationalization through operational flexibility, however, requires that the firm possess the managerial skills and organizational resources to coordinate its activities in response to changing external conditions (Kogut, 1985). Therefore, not all firms may be aware of and able to exploit the potential that is offered by international arbitrage and leverage opportunities. Further, the benefits of operational flexibility are contingent on factors outside the firm. Several studies model the effects of different external conditions that impact the value of maintaining and exploiting operational flexibility.

Kogut and Kulatilaka (1994) develop a stochastic dynamic programming model for evaluating an MNC's benefits of maintaining production sites in two countries, when there is uncertainty in the fluctuation of real exchange rates between the two locations. The model shows that the value of having the option of shifting production across both locations, in order to minimize total production costs, is greater in periods of higher volatility of exchange rates. Huchzermeier and Cohen (1996) demonstrate that the costs of adjustment of product design and supply chain configuration in the foreign locations determine the net benefits of a flexible system to cope with exchange rate fluctuations. Similarly, Dasu and Li (1997) model the influence of several location-specific factor costs with different cost functions and deliver a numerical solution on when and how firms should alter production quantities between the plants.

Additional studies propose a variety of specific solutions for optimal configurations of international production planning under uncertain cost developments (e.g., Mello, Parsons, & Triantis, 1995; Nembhard, Shi, & Aktan, 2005). From a theoretical perspective, all these studies stress the importance of possessing flexibility because of changing external cost conditions. International business research has also delivered empirical evidence that MNCs actually make use of the potential for operational flexibility by adjusting their international activities according to changed cost conditions.

Kogut and Chang (1996) investigate the role of exchange rate movements in subsequent investments of 95 Japanese electronics firms within the U.S. The findings suggest that in years when the yen depreciates vis-à-vis the U.S. dollar, that is when imports to the U.S. become relatively more competitive, firms defer further investments in production affiliates and rather serve the U.S. market via their sales subsidiaries. Rangan (1998) analyses home-content levels of U.S. affiliates of foreign firms and of foreign affiliates of U.S. firms on industry-aggregated level. The results reveal that firms adjust their input mix of local and foreign components according to exchange rate movements between the respective countries. However, the strength of reaction is rather moderate; for example, U.S. firms reacted to a 40 percent depreciation of the U.S. dollar vis-à-vis the Deutsche mark (between 1985 and 1989) with an increase of less than two percentage points in the U.S. content of products sold in German affiliates. U.S. affiliates of German firms reduced German content in products sold by less than four percentage points. The two studies deliver empirical evidence that MNCs respond to changing cost conditions that are caused by exchange rate movements, by adjusting their international production activities. The analyses,

however, only incorporate two countries, the home and a foreign market, rather than a network of internationally dispersed affiliates. Further, market motives seem to dominate over efficiency considerations as the driving factors for resource deployment decisions in the specific empirical environments.

Widening the network perspective to a greater set of locations, Belderbos and Zou (2007) investigate the influence of labor costs on capacity adjustment decisions within a network of foreign production subsidiaries. Drawing on a sample of manufacturing affiliates of 412 Japanese investors in nine Asian countries, they find that labor cost growth in the focal location has a significant negative influence, whereas labor cost growth in the remaining countries of the network has a significant positive influence on the employment growth in a particular country. MNCs obviously also exploit the flexibility potential offered by a multinational network by adjusting labor capacity according to the wage developments within a set of several host countries. Chung et al. (2010) demonstrate with a similar sample (manufacturing subsidiaries of 471 Japanese investors in five Asian countries) that MNCs make use of operational flexibility by an increased number of employees and a higher sales volume when the external conditions are uncertain.

### 2.2.2 Performance effects of operational flexibility

Besides investigating the conditions that determine the exploitation of operational flexibility, extant research also analysed the benefits of maintaining operational flexibility in terms of performance effects to the MNC. Benefits of multinationality due to operational flexibility have been acknowledged by a large number of studies

that aim at revealing the performance outcomes of internationalization (Pantzalis, 2001; Tallman & Li, 1996; Thomas & Eden, 2004). Empirical studies that employ commonly used measures of multinationality such as the ratio of foreign assets to total assets (Miller & Reuer, 1998), the spread of activities across foreign locations (Kim, Hwang, & Burgers, 1993), or composite internationalization measures (Lu & Beamish, 2004) to detect performance effects of operational flexibility, however, may fail to ascribe performance outcomes of internationalization unambiguously to operational flexibility. Rather, other potential benefits of multinationality, for example, economies of scale or access to valuable resources may be superimposed on the effects of operational flexibility.

Allen and Pantzalis (1996) introduced a measurement concept that differentiates the international configuration into breadth (number of host countries) and depth (ratio of sum of subsidiaries in the two host countries with the largest number of subsidiaries to total number of foreign subsidiaries). The authors define high (low) breadth as being active in more (equal or less) than 10 countries and high (low) depth as having more (equal or less) than 25 % of subsidiaries in the two countries with most subsidiaries. MNCs are categorized into four groups according to their breadth/depth configuration (high breadth/high depth, high breadth/low depth, low breadth/high depth, low breadth/low depth). The empirical analysis of 363 MNCs based in the U.S. reveals that firms with a high breadth and low depth configuration outperform domestic firms as well as MNCs with other configurations in terms of higher market valuation. These results are interpreted as support for the notion that high breadth offers greater potential of operational flexibility, whereas high depth leads to higher agency costs of managing extensive multinational networks. Tang and Tikoo (1999) replicate the

findings of Allen and Pantzalis with a sample of 589 U.S. based manufacturing MNCs and confirm that a configuration of high breadth and low depth is favored by the stock market over alternative configurations. Recently, Lee and Makhija (2009) followed this methodology when extending the breadth/depth model by an explicit consideration of different sources of exogenous uncertainty on the market valuation of operational flexibility. The market valuation effects of different configurations are tested on a panel of 270 Korean firms over a period of 16 years. Two sources of uncertainty are considered: domestic uncertainty (variance of the weekly Korean stock market index) and exchange rate uncertainty (variance of monthly exchange rates between the Korean won and the U.S. dollar). The findings indicate that under conditions of domestic uncertainty, the stock market favors international configurations with high breadth and low depth. Under conditions of exchange rate uncertainty, on the other hand, firms with low breadth and low depth gain higher valuations in comparison to alternative configurations. Operational flexibility, hence, seems to offer an appropriate means of reacting flexibly to uncertain economic developments in the home market rather than to exchange rate fluctuations, which can be hedged by firms without being present in a larger number of foreign markets.

Drawing on the number of host countries to quantify the potential benefits of operational flexibility, however, delivers not only linear positive results. Tong and Reuer (2007) argue that with rising number of host countries, the advantages of operational flexibility lead to decreasing marginal returns. Being active in a large number of host countries rather increases the coordination costs of international activities, which may finally outweigh the benefits and will reveal negative performance outcomes. Using a sample of U.S. based manufacturing firms, the

authors find support for their notion by a curvilinear relationship between the number of host countries and downside risk (which denotes return on assets and equity below industry average, respectively). With a rising number of host countries, downside risk will first decrease and then increase. Congruent findings were delivered by Chung, Lu, and Beamish (2008) with a sample of Japanese MNCs' subsidiaries in Asia. Their results reveal that the probability of subsidiaries being profitable will first increase and then decrease with rising number of countries. Reuer and Leiblein (2000), despite expecting a positive effect of the number of host countries on firm performance, cannot find a significant influence when investigating international joint venture activities of a sample of manufacturing firms based in the U.S. The authors conclude that in spite of the promise of operating flexibly, reality shows firms with apparently limited capabilities for managing international investments as options. Other studies even detect a significant negative influence of the number of host countries on firm performance (Ogasavara & Hoshino, 2009; Vermeulen & Barkema, 2001) or a performance influence that is at first decreasing and then increasing with a rising number of countries (Lu & Beamish, 2001).

Basically, the number of host countries seems to be a suitable measure for quantifying a firm's potential to shift production capacity across borders in response to changed cost conditions. However, the divergent empirical findings on the performance outcomes of possessing operational flexibility point to the need for analysing the conditions that enable a firm to exploit operational flexibility efficiently in more detail. Qualitative properties of the network rather than the size alone seem to determine the degree to which an MNC can benefit from international production shifting. As a next step, we will describe which characteristics of the individual production affiliate, as

well as of the production network as a whole, influence the efficient exploitation of operational flexibility.

### 2.2.3 Factors determining the efficient exploitation of operational flexibility

A multinational network of production subsidiaries provides firms with the opportunity to shift production capacities in response to changing external conditions. Production shifting across locations, however, is associated with costs (Kogut & Kulatilaka, 1994). Besides additional set-up costs, loss of optimal capital utilization etc. that accrue every time a firm alters production capacities across its subsidiaries, the characteristics of the individual production site within an international network lead to specific costs of shifting for the MNC. Those costs are influenced by factors inside and outside the production affiliate.

Factors inside the production subsidiary that determine the efficiency of allocating resources across countries can be influenced by the MNC up to a certain degree. Insufficient technical or organizational characteristics of a particular foreign production affiliate, however, may be revealed just at the moment when capacities are to be shifted. Technically, the individual subsidiary is required to maintain product lines that can be shared with their counterparts in other countries (Kogut, 1985). On an organizational level, a subsidiary's managers must be willing and able to enforce employment reductions, which may represent lower power of the affiliate's management or may lead to serious resistance of employees within the subsidiary (e.g., Blazejewski, 2009). Furthermore, the flexibility to decide on capacity adjustments might be lower when the investor does not have the full power to make decisions, i. e.

the subsidiary is not wholly-owned but is a joint venture with a local partner who has to agree to allocation decisions in the focal market (Tong & Reuer, 2007).

Factors outside the production affiliate are given, for example, by political and social institutions or regulatory frameworks in a host country. Since capacity adjustments impact the number of people employed in a location, national labor market regulations such as overtime constraints, employee layoff, as well as the power of labor unions are crucial to the actual costs that arise from resource allocation decisions. Even though the impact of national labor market regulations on MNC behavior attracts rising attention in international business research (Chacar, Newburry, & Vissa, 2010; Pajunen, 2008), empirical evidence on the influence on international production-shifting practices is missing to date. As a first approach, Pull (2008) argues that U.S. based firms which are facing volatile product demand (and therefore have to adjust production capacity regularly) prefer the U.K. as a business location over Germany since the British labor law is more flexible than the German one. The results of a survey covering 52 firms, however, do not empirically support this notion.

Another aspect is the average qualification level in a country. Shifting production capacities across locations requires employees to adapt to changing production processes. A well-qualified workforce in the individual location offers more flexibility to react to changing demands and causes less costs for an altered production schedule. Several studies investigate the qualification of the workforce as a determinant for location choice of foreign investors (Geishecker, Goerg, & Munch, 2010; Pull, 2008). Empirical evidence on its influence on the efficiency of international shifting activities of firms, however, still has to be provided.

A location's appropriateness as a production site within an international network, however, also depends on its relative fit to the other locations of the investor's portfolio. Production locations which are geographically widely spread generate higher costs of transportation of intermediate or final goods when transferred across locations. Those costs might urge firms to choose locations in one geographic region rather than across all regions of the world (Rugman & Verbeke, 2004). Further, countries exhibit different trade regulations, e. g. tariffs, quotas, import, and export restrictions, which are specific to the type of product, shipment quantity, and origin or destination, respectively. MNCs that shift activities across their foreign locations have to consider the costs that are accrued when goods pass borders (Buckley & Casson, 1998). As a consequence, firms may choose countries within a certain area that offers favorable conditions such as regional free trade areas or common markets.

Higher costs of production shifting may also arise if the infrastructure of a location is very different or incompatible to the remaining sites of the network. Technical infrastructure should allow plants to manufacture outputs of similar quality as well as to reduce costs of information processing via similar standards of information technology, for example, availability of internet services etc. (Buckley & Casson, 1998). Transport infrastructure in form of rail, roads, or airports should ensure an easy interconnection of a production network's different sites (Buckley & Casson, 1998). Further, coordination within a network will induce higher costs when the involved countries are culturally very different. Problems may occur due to different languages, social norms, or working and business cultures (e.g., Hofstede, 1980). Studies have shown that cultural difference within an international network might lower the performance of business activities (Hutzschenreuter & Voll, 2008; Tong & Reuer,

2007).

Concerning production cost conditions, however, homogeneity among the locations of a production network is not useful. Earlier studies revealed that heterogeneity within a portfolio of host countries can be decisive for a firm's success (Goerzen & Beamish, 2003; Pantzalis, 2001) since it accounts for an MNC's ability to balance economic (demand) risks. Firms that establish an international production network in order to obtain operational flexibility should ensure that they can balance risks of labor cost developments. Cost developments in the different locations should be dissimilar, i. e. production costs must not change in parallel. If they do, the MNC does not have the alternative of responding to changed cost conditions in a location with capacity shifting to another location.

Belderbos and Zou (2009) analyse diversity of cost developments within international production networks in order to identify redundant locations within that network. The study draws on correlations of the monthly real exchange rates of a focal country and the other host countries within the network. The analysis discloses that subsidiaries in countries that have a strong correlation with exchange rate developments in the other locations of the network seem not to offer a sufficient alternative for shifting and are more likely to be divested. Building on those findings, Chung et al. (2010) present similar results. The study extends the measurement of exchange rate correlations by a focal country's correlation of exchange rate developments with exchange rate developments of all countries in the world. Further, those correlations are calculated as year-to-year change which delivers a variable with varying values during the observation period. The empirical results support the assumption that foreign subsidiaries which are established for the purpose of across-country flexibility (as

indicated by the export vs. local sales ratio), are less likely to be expanded, both in terms of employees and sales, when they are located in countries that feature high redundancy of exchange rate developments.

The results of both the above studies substantiate the notion that countries of a multinational production network must feature diversity in cost developments in order to provide valuable options for shifting production capacity within the network. Exchange rates, however, are not the only source of volatility of cost developments. Depending on the configuration of a multinational network, for example, in regions with a dominant or single currency such as the euro area, diversity of national labor cost developments themselves may have a much stronger influence on cost conditions than exchange rates. Corresponding empirical results on the influence of diversity of labor cost developments are missing to date, which seems partly due to the lack of adequate data (Belderbos & Zou, 2009).

## 2.3 Conclusion

Traditional theoretical approaches stress characteristics of the individual foreign location as determinants of a firm's decision to establish a production subsidiary. Since firms are increasingly competing on the world market, the need to produce on most efficient scale under volatile external cost conditions has become an important motivation for firms to invest in an integrated multinational production network (Buckley & Casson, 1998). Maintaining an international production network provides firms with operational flexibility to shift production capacity according to changing cost developments (Kogut, 1985).

Extant research has demonstrated that MNCs actually make use of the flexibility potential that is offered by a multinational network. Multinational firms were found to adjust production processes according to exchange rate movements (Rangan, 1998) and changes in labor costs (Belderbos & Zou, 2007). In line with the argument that this flexibility to react to volatile cost developments rises with network size, several studies revealed that the number of foreign locations of an investor's portfolio is positively associated with firm performance (Allen & Pantzalis, 1996; Tang & Tikoo, 1999).

However, the size of a production network is not the only factor that determines a firm's ability to exploit the potential of operational flexibility. On the one hand, the single locations of the network offer a specific flexibility to shift production capacities, for example, in terms of labor market regulations. On the other hand, a location's fit within the portfolio determines the flexibility of capacity adjustments, for example through its contribution to diversity of cost developments within the network. MNCs that intend to shift production capacities across the locations of their production network may find that the existing network does not reveal the desired level of flexibility. In that case, firms can reconfigure their international production activities by establishing new or withdrawing existing locations from the portfolio. These reconfiguration decisions that enhance the flexibility to adjust production processes within an international production network might lead to an improved performance of international activities rather than the size of the network.

In the next chapter of this study we will analyse to what extent cost and flexibility characteristics of the current set of foreign locations will induce investors to enlarge the production network by an additional foreign production site. Decisions to

withdraw locations from the network are analysed in chapter four, before the performance effects of an MNC's decision to reconfigure its international production network are investigated in chapter five.

# 3. EXPANSION OF INTERNATIONAL PRODUCTION NETWORKS

## 3.1 Research context

Most of the research on international production in accordance with the traditional theories of internationalization such as Johanson and Vahlne (1977) or Dunning (1988) centers on the question of whether multinational corporations establish production subsidiaries in foreign markets. Typical motives of expanding production to foreign markets are reducing transaction and transportation costs, adapting products to local tastes, or circumventing trade barriers (Dunning & Lundan, 2008). However, if foreign direct investments are supposed to increase the efficiency of the corporate production system rather than improve the access to a particular market, the decision-maker's scope widens from the potential target location to the whole set of production locations maintained by he firm. In fact, the basic decision to complement the production network may precede the decision to choose a certain location. This chapter seeks to explain the decision to establish a new production subsidiary as a consequence of cost and flexibility shortcomings of the existing network of production units and to demonstrate that firms choose a location that compensates for those deficiencies. Under these circumstances, the quality of production locations is path-dependent and company-specific.

The efficiency improvement contributed by an additional plant needs to be viewed in a dynamic perspective. Only few studies have examined the effects of prior international investments on the establishment of new foreign subsidiaries in a time-

series approach. Chang and Rosenzweig (2001) find that a firm's competitive advantage and diversification as well as its cultural distance to the host country influence the entry mode of subsequent investments (greenfield vs. joint venture or acquisition). After Davidson (1980), Kogut and Chang (1996) show that MNCs tend to invest in countries they have entered before. Delios and Henisz (2003) reveal that experience from other foreign countries also increases the probability of further foreign direct investments. Tan and Vertinsky (1996) analyse the timing of subsequent market entries and identify network economies as another theoretical explanation for the positive influence of prior entries. They also mention the ability to shift production among plants in different locations. However, they do not elaborate this argument and do not provide empirical evidence.

The remainder of the chapter is structured as follows: The theory section develops a model that incorporates the net present value of the existing production network and the value that is offered by the flexibility to react to factor cost changes. The third section describes the empirical research design; the fourth section presents the results. A discussion of the findings, including the limitations of this analysis as well as implications for management and future research, conclude the chapter.

## 3.2 Theoretical development

International diversification can be an appropriate strategy to cope with uncertainties of local production conditions such as labor market developments, institutional regulations, or exchange rate fluctuations. By building an international network of subsidiaries, the MNC creates operational flexibility and gains the ability to react to

changes in uncertain external developments by production shifting (Kogut, 1985).

The opportunity to shift production internationally requires manufacturing to be spread over multiple locations. Experience from earlier international entries facilitates the establishment of new subsidiaries (Chang & Rosenzweig, 2001; Delios & Henisz, 2003; Henisz & Delios, 2001). Even though additional subsidiaries boost the cost of coordination (Berry, 2006; Gomes & Ramaswamy, 1999) and may outweigh the positive influence of experience, the empirical findings reveal a positive relationship between the number of earlier entries and the propensity to commit additional investments.

Extant findings on additional investments refer to foreign subsidiaries in general. Regarding international production, Tong and Reuer (2007) stress the benefits of operational flexibility provided by a multiplicity of host countries. The profit potential of operational flexibility increases as the international production network grows. However, operational flexibility yields decreasing marginal returns to network size (Chung, Lu, & Beamish, 2008). Due to the diminishing contributions of additional investments to operational flexibility and learning, the coordination costs, which increase rapidly in an international production network, are likely to finally override the positive effects. Therefore we predict a non-linear rather than a monotonously positive influence of network size on the establishment of a new production subsidiary.

> *Hypothesis 3.1: As the number of countries used as production locations rises, the propensity to establish an additional production subsidiary will first increase and then decrease.*

Besides its sheer size, the utility of a production network will be influenced by its cost

and flexibility characteristics under uncertain environmental conditions. Differing from the study by Kogut and Kulatilaka (1994) that accounts for the value of flexibility under exchange rate fluctuations, we shed light on the impact of factor cost developments in different countries. MNCs benefit from arbitrage opportunities presented by the cost differences of locally sourced inputs that are not priced in world markets, above all labor (Kogut, 1985). Belderbos and Zou (2007) show that labor cost changes have an influence on capacity adjustments in international production.

We analyse the value $V$ of a network of international production subsidiaries to derive the need for a new subsidiary as a complement for improving the existing network. From an investment perspective, the value of a production network is given by its net present value $NPV$. From a strategic viewpoint, the value holds a second component: A set of subsidiaries that allows for responding profitably to the realization of uncertain events by shifting production within the network provides a value $F$ from operational flexibility (Kogut & Kulatilaka, 1994)

$$V = NPV + F \ .$$

The production network is exposed to labor cost developments in various countries, which may affect the cost of production. Productivity can be influenced by the MNC through technology and training, thus cost-efficient production is also possible in high-wage countries (Mucchielli & Saucier, 1997). However, at an attained level of productivity, increasing labor costs erode the net present value $NPV$ of the production network. If cost savings in the existing locations do not suffice to recover production efficiency, the MNC is prone to consider different locations as complements and maybe – in the long run – as substitutes for those locations (Belderbos & Zou, 2006).

Accordingly, we assume that rising labor costs in the existing locations will encourage MNCs to expand their international production networks by a new affiliate.

*Hypothesis 3.2a: Rising labor cost in the existing network of production subsidiaries increases the propensity to establish an additional production subsidiary.*

As the MNC responds to labor cost disadvantages of its existing production network, it will place the investment in a location that helps alleviate the rise in labor costs and thereby increase the net present value of the network.

*Hypothesis 3.2b: The location chosen for an additional production subsidiary contributes to reducing the labor cost growth of the network of production subsidiaries.*

Uncertainties in the developments of labor costs within an international network of production facilities make the choice of efficient manufacturing technologies and the design of cost-minimizing production processes difficult (de Meza & van der Ploeg, 1987). Labor cost volatility leads to an extra discount on the cash flows that are going to be generated by the existing production sites and decreases the net present value *NPV*. Alternative locations may have more stable labor costs. We therefore expect that uncertain wage developments urge MNCs to complement their international production system by a new investment.

*Hypothesis 3.3a: Uncertainty of labor costs in the existing network of production subsidiaries increases the propensity to establish an additional production subsidiary.*

Facing labor cost uncertainty in the existing production network, the MNC will choose a location that strengthens the net present value of the production network through more predictable labor costs.

> *Hypothesis 3.3b: The location chosen for an additional production subsidiary contributes to reducing the labor cost uncertainty of the network of production subsidiaries.*

Changing environmental conditions are less critical to the MNC if it is possible to balance the related movements. When production costs are uncertain, it is valuable to have an across-country option to shift production (Kogut & Kulatilaka, 1994). However, Chung et al. (2010) show that MNCs do not shift production internationally if macro-economic conditions among subsidiary locations are redundant, i. e. environments change in parallel. A high flexibility value *F* of a network of production subsidiaries is based on two necessary conditions. The first factor driving the value of flexibility is the *need* to operate flexibly, which originates from the uncertainty of labor cost developments within the established production locations. The second factor is the *opportunity* to operate flexibly, which is provided by the diversity of labor cost developments across the established production locations. If the flexibility value of the production network is high due to high uncertainty and high diversity of labor cost developments, the MNC is likely to maintain the present network and shift production across countries from locations with rising labor costs to locations with falling labor costs. Thus, we expect that

> *Hypothesis 3.4a: Under high uncertainty of labor costs, the diversity of labor cost developments in the existing network of production subsidiaries*

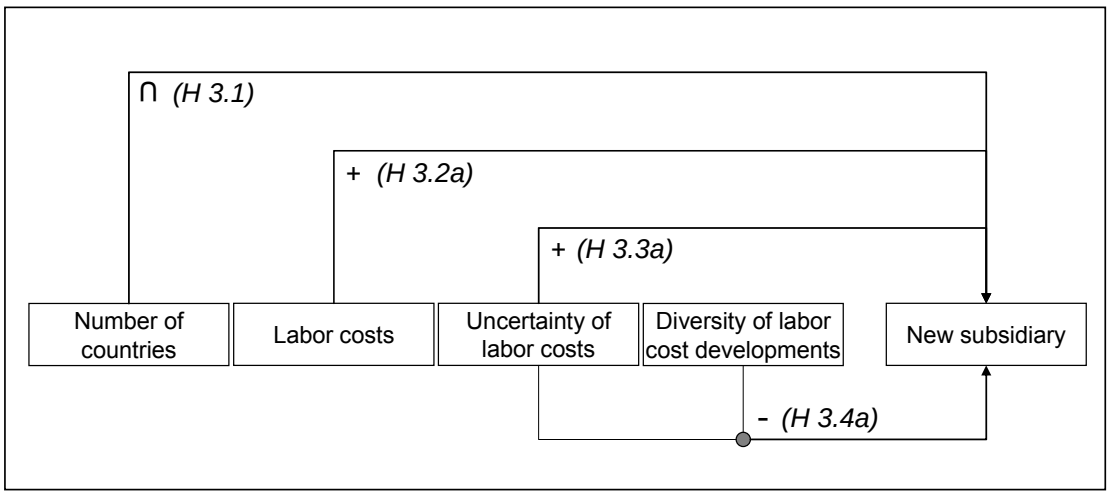
*reduces the propensity to establish an additional production subsidiary.*

If the flexibility value *F* of the existing production network is unsatisfactory, the MNC may consider establishing a new production site. Establishing a new site can boost the flexibility value of the network *F* by an increase in uncertainty or an increase in diversity. Locations with uncertain labor costs are undesirable as they create the need rather than the opportunity to be flexible and, in addition, decrease the net present value *NPV* of the network. By contrast, it seems likely that MNCs choose a location featuring a labor cost development which is different from the existing locations.

*Hypothesis 3.4b: The location chosen for an additional production subsidiary contributes to increasing the diversity of labor cost developments of the network of production subsidiaries.*

Figure 3.1 illustrates the propositions of *Hypotheses 3.1*, *3.2a*, *3.3a*, and *3.4a*. Since *Hypotheses 3.2b*, *3.3b*, and *3.4b* do not draw on the same dependent variable, we will not summarize them in a graph.

Figure 3.1: Illustration of hypotheses on the propensity to establish a new subsidiary



## 3.3 Empirical methods

### 3.3.1 Data

The Central Bank of Germany maintains a database that comprises anonymous information about all foreign direct investment objects of German parent firms – including the German parent firms held by foreign investors – above a balance sheet total of currently € 3 million. The reports include balance sheets, the stock of foreign direct investment, and other characteristics of the foreign subsidiaries. They are available as panel data on a yearly basis and are assigned to investors by consistent identification numbers from 1996 on; new entries can be identified starting in 1997. For the present analysis, we closed the data set with definite figures from 2006 and preliminary figures from 2007.

The investors and investment objects in the database are classified by industry codes. As sales subsidiaries are classified as trading companies, we can filter out the production affiliates of manufacturing firms. Production shifting causes a considerable effort in adapting an MNC's value chain and involves additional transportation and coordination costs. A smaller distance facilitates earning the benefits of operational flexibility (Rugman & Verbeke, 2004). Following Belderbos and Zou (2007), we limit the analysis of production subsidiaries to one geographical region. As Europe is the most relevant production region of German MNCs accounting for 56 % of their foreign production, our investigation targets European production locations. Due to the euro as a common currency and its influence on the currencies of European countries outside the euro zone, exchange rate fluctuations play a minor role in the European region (ECB, 2007). However, there is a remarkable diversity of labor cost developments.

Starting in 2002, the Central Bank added detailed information about the investors, which is valuable for the study. For the longest possible observation period with full data availability, we focus on the first establishment of a production affiliate between 2002 and 2007 (if it occurs) after the last establishment of such an entity since 1997. Investment objects with a return on sales below -1000 % or above 1000 % were excluded from the analysis as outliers. To avoid a bias from in-country firm restructuring, we did not consider the establishment of subsidiaries that compensated for subsidiary closures in the same country and year. However, in order to treat new investments without prejudice, we did not eliminate the establishment of sites in those countries which had been chosen as production locations by the MNC beforehand. We finally obtained a panel of 352 investors.

Besides the firm-level data of the German Central Bank we included country-level data in our analysis. The macroeconomic data were obtained from the World Bank. Data on national labor costs were taken from statistical reports of the International Labour Organization (ILO).

### 3.3.2 Measures

*Dependent variable*

The dependent variable *new subsidiary* takes the value one in the year in which an investor establishes an additional production subsidiary abroad, and zero otherwise. Within the period between 2002 and 2007, 245 of the 352 investors established a new subsidiary.

*Independent variables*

Operational flexibility requires maintaining multiple production locations. Previous studies use the number of host countries as an indicator of operational flexibility (Reuer & Leiblein, 2000; Tallman & Li, 1996). Accordingly, we quantify the potential of a foreign production network to provide operational flexibility by the number of countries (*NOC*) in which an investor maintains production subsidiaries.

We expect to find an impact of changing factor prices in the existing production locations on the decision to make an additional investment. Data on national wages were taken from ILO's Key Indicators of the Labour Market (KILM) databank, 5th edition (2007). To calculate *labor cost development*, we use the real manufacturing wage index as a basis, which is the nominal wages index corrected for changes in purchasing power measured by the consumer price index (100 * nominal wage index/consumer price index). We subtract the wage index of the previous year from the wage index of the present year and calculate the mean across all existing production locations of the MNC in a year.

We also draw on the ILO real manufacturing wage index to measure *uncertainty of labor costs*. In the same way as earlier studies that incorporate uncertainty by the volatility of a macroeconomic indicator (Campa, 2004; Folta & O'Brien, 2004), we use an autoregressive conditional heteroskedastic (ARCH) process (Engle, 1982) to estimate the degree to which the current wage index could not be expected by the investors looking at the past development. To obtain a measure of the uncertainty of labor costs in the entire portfolio, we compute the mean volatility across all locations in a year.

The variable *diversity of labor cost developments* shall reflect the heterogeneity of contemporary labor cost developments across the locations of the production network. We calculate the variance in real manufacturing wage growth of the current set of host countries within a year. Since the decision to enlarge the extant network takes time to be implemented, all the variables including the controls are lagged by one year.

*Control variables*

Market growth is a predominant location factor in market-seeking investment decisions (e.g., Buckley, Devinney, & Louviere, 2007). The study in hand focuses on efficiency-related motives of investment, where local market growth may be less important. However, as we cannot distinguish efficiency-seeking from market-seeking production subsidiaries in the anonymous dataset, we control for market-related motives of investment: Weak market growth in the given locations could be a motive for investing in a different location. We operationalize *GDP growth* by the mean GDP growth rate in the existing host countries. Previous research suggests that the geographic situation of a country influences a firm's decision to invest (Brush, Maritan, & Karnani, 1999; Nachum, Zaheer, & Gross, 2008). Accordingly, the geographic distribution of the existing network may be crucial for the establishment of additional production sites. Similar to Bouquet and Birkinshaw (2008) as well as Ojala and Tyrväinen (2007), we calculate the mean capital-to-capital distance of the existing locations to the home country Germany as a measure of *geographic distance*. Flores and Aguilera (2007) point to a negative influence of cultural distance on the likelihood to invest in a new foreign market. Cultural differences of the existing network may also be influential for the probability to establish an additional

production subsidiary. We operationalize *cultural distance* using the cultural indices of Hofstede (1980). Following previous work (Chang & Rosenzweig, 2001), we first calculate the square root of the sum of squared differences between the four cultural dimensions of the respective host countries and Germany, divided by four, and then compute the mean across all existing locations.

Additional sites may be established due to capacity limitations of the existing production locations as the firm grows. To separate the effects of growth from cost and flexibility considerations, we control for the *employment growth* rate within the existing production network. Since company size may foster (e.g., Tan & Vertinsky, 1996) or suppress (e.g., Chan, Makino, & Isobe, 2006) international expansion, we control for *size* by the total of employees working for the existing production network. MNCs owned by private individuals or families exhibit internationalization strategies that are different from other ownership types (George, Wiklund, & Zahra, 2005; Zahra, 2003). Ownership may therefore affect the international production configuration. We include the dummy variable *ownership* which has the value one if the firm is held by a domestic private individual or family, and zero otherwise. Time dummies account for overall effects that may impact on the establishment of additional production subsidiaries in the individual years. Table 3.1 summarizes the variables measurement and the descriptive statistics. Due to confidentiality policies, minimum and maximum values of firm-level variables need to refer to the average of the highest and lowest three observations.

Table 3.1: Variables measurement and descriptive statistics

| Name | Description | Mean | StdDev | Min | Max |
|---|---|---|---|---|---|
| *uncertainty of labor costs* | Average volatility of labor cost developments within portfolio (estimated by ARCH models) | 73.73 | 151.40 | 0.52 | 1039.99 |
| *labor cost development* | Average real manufacturing wage growth rates across countries in the portfolio | 1.77 | 3.56 | -10.20 | 22.20 |
| *NOC* | Number of host countries | 2.61 | 1.93 | 1 | 14.67 |
| *diversity of labor cost developments* | Variance of wage growth rates across countries in the portfolio | 9.58 | 34.99 | 0 | 537.92 |
| *GDP growth* | Average GDP growth rates within portfolio | 2.67 | 1.81 | -1.93 | 13.50 |
| *geographic distance* | Average capital-to-capital distance of the host countries to Germany | 942.51 | 476.37 | 279.76 | 3879.89 |
| *cultural distance* | Average cultural distance between host countries and Germany | 51.84 | 12.30 | 24.72 | 93.52 |
| *employment growth* | $(\text{Number of employees within portfolio})_t$ - $(\text{number of employees within portfolio})_{t-1}$ | 0.18 | 1.35 | -0.89 | 12.24 |
| *size* | Number of employees within portfolio | 835.26 | 2006.08 | 3.33 | 16558.33 |
| *ownership* | Dummy (=1 if the firm is held by a domestic private individual or family) | 0.34 | 0.47 | 0 | 1 |

Number of observations: 352

## 3.4 Results

### 3.4.1 Propensity to establish an additional foreign production subsidiary

The correlation matrix in Table 3.2 reveals that the variables are mostly independent of each other. There is some correlation between *uncertainty of labor costs* and *GDP growth* which indicates that economies that feature strong growth rates are more unpredictable. This finding seems plausible regarding the macroeconomic developments in Eastern Europe. The positive correlation between *NOC* (number of host countries) and *size* (number of employees in those locations) is obvious as well. The variance inflation factors (VIF) still indicate an acceptable level of multicollinearity.

Table 3.2: Correlation matrix and variance inflation factors

| | Variable | *1* | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* | VIF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *1* | *uncertainty of labor costs* | 1 | | | | | | | | | | 1.60 |
| *2* | *labor cost development* | 0.05 | 1 | | | | | | | | | 1.20 |
| *3* | *NOC* | -0.05 | 0.14 | 1 | | | | | | | | 1.48 |
| *4* | *diversity of labor cost developments* | 0.23 | 0.31 | 0.23 | 1 | | | | | | | 1.27 |
| *5* | *GDP growth* | 0.52 | -0.17 | -0.02 | 0.09 | 1 | | | | | | 1.62 |
| *6* | *geographic distance* | -0.01 | 0.07 | 0.06 | 0.11 | 0.19 | 1 | | | | | 1.15 |
| *7* | *cultural distance* | -0.07 | -0.16 | -0.01 | 0.01 | 0.10 | -0.18 | 1 | | | | 1.13 |
| *8* | *employment growth* | 0.03 | 0.00 | -0.06 | -0.03 | 0.05 | -0.02 | -0.05 | 1 | | | 1.01 |
| *9* | *size* | -0.06 | 0.03 | 0.52 | 0.05 | 0.01 | -0.03 | 0.04 | -0.05 | 1 | | 1.42 |
| *10* | *ownership* | 0.13 | -0.01 | -0.14 | -0.10 | 0.01 | -0.03 | 0.08 | 0.05 | -0.17 | 1 | 1.09 |

Number of observations: 352

To test *Hypotheses 3.1*, *3.2a*, *3.3a*, and *3.4a,* we employ hazard rate models of the propensity to establish an additional production subsidiary abroad. The hazard rate is defined as the probability that an event occurs in a given time interval divided by the length of that interval. After exploring the dataset with semi-parametric hazard rate models (Cox, 1972) we estimated more efficient, parametric Weibull models. They are presented in Table 3.3. All regressions feature a significant Weibull parameter $p > 2$ indicating a progressively increasing baseline hazard, which reflects a rising probability of establishing an additional foreign production subsidiary in the course of time. This finding corresponds to Kogut's (1983) understanding of FDI as a sequential

process of reinvesting earnings in foreign markets.

Table 3.3: Weibull hazard rate regression models of the propensity to establish an additional production subsidiary abroad

| *new subsidiary* | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 |
|---|---|---|---|---|---|---|---|
| *uncertainty of labor costs X diversity of labor cost developments* | | | | | | -1.66E-5*** (3.13E-6) | -8.38E-6** (3.62E-6) |
| *uncertainty of labor costs* | | | | | 0.0016*** (0.0005) | 0.0020*** (0.0005) | 0.0019*** (0.0005) |
| *labor cost development* | | | | 0.0790*** (0.0179) | | | 0.0617*** (0.0204) |
| *NOC²* | | | -0.0441*** (0.0146) | | | | -0.0411*** (0.0141) |
| *NOC* | | 0.2814*** (0.0365) | 0.6944*** (0.1326) | | | | 0.6429*** (0.1334) |
| *diversity of labor cost developments* | 0.0038*** (0.0011) | 0.0030** (0.0013) | 0.0027** (0.0013) | 0.0017 (0.0013) | 0.0016 (0.0013) | 0.0137*** (0.0022) | 0.0049* (0.0029) |
| *GDP growth* | -0.1283*** (0.0401) | -0.1082*** (0.0413) | -0.1106*** (0.0418) | -0.1096*** (0.0409) | -0.1988*** (0.0465) | -0.2163*** (0.0460) | -0.1821*** (0.0485) |
| *geographic distance* | 0.0004** (0.0002) | 0.0003* (0.0002) | 0.0002 (0.0002) | 0.0004** (0.0002) | 0.0005*** (0.0002) | 0.0006*** (0.0002) | 0.0003** (0.0002) |
| *cultural distance* | 0.0040 (0.0049) | 0.0045 (0.0052) | 0.0024 (0.0054) | 0.0057 (0.0049) | 0.0075 (0.0051) | 0.0112** (0.0053) | 0.0100* (0.0057) |
| *employment growth* | 0.0330 (0.0544) | 0.0449 (0.0582) | 0.0523 (0.0593) | 0.0265 (0.0568) | 0.0263 (0.0576) | 0.0280 (0.0601) | 0.0376 (0.0668) |
| *size* | 0.0002*** (3.17E-5) | 0.0001 (4.09E-5) | 0.0001** (4.33E-5) | 0.0002*** (3.17E-5) | 0.0002*** (3.14E-5) | 0.0002*** (3.03E-5) | 0.0001*** (4.25E-5) |
| *ownership* | -0.5361*** (0.1500) | -0.4295*** (0.1498) | -0.3978*** (0.1505) | -0.5666*** (0.1501) | -0.6527*** (0.1559) | -0.6957*** (0.1581) | -0.5861*** (0.1586) |
| *p* | 2.3757*** (0.1201) | 2.5697*** (0.1299) | 2.5818*** (0.1296) | 2.4500*** (0.1238) | 2.4109*** (0.1219) | 2.5054*** (0.1259) | 2.7027*** (0.1350) |
| *Log likelihood* | -266.98 | -243.03*** | -236.29*** | -258.54*** | -262.53*** | -249.95*** | -222.32*** |
| *Reference* | no | Model 1 | Model 2 | Model 1 | Model 1 | Model 5 | Model 1 |

Estimation with time dummies; *** p < 0.01; ** p < 0.05; * p < 0.1; Standard errors in parentheses

Model 1 is the base model comprising the control variables. It features a log likelihood of -266.98. *Ownership* exerts a negative influence on the propensity to

establish an additional production subsidiary, which may be ascribed to a greater risk aversion of family owners. The *size* and *geographic distance* of the present foreign operations are positively associated with an enlargement of the network. *GDP growth* in the existing locations decreases the urge to establish an additional production affiliate due to the importance of market-related motives for production locations that have been put forward by previous studies. The variables *employment growth* and *cultural distance* do not seem to have an influence and stay insignificant in nearly all of the following models. As *diversity of labor cost developments* is instable across the models without considering the related *uncertainty of labor costs*, it does not seem to have a clear impact on the decision to enter a new location.

Model 2 introduces the linear term of *NOC*. The log likelihood increases significantly to -243.03 (likelihood ratio test). Model 3 tests *Hypothesis 3.1* by including the squared term of *NOC*, which again increases the log likelihood to -236.29. The linear term is positively and the squared term negatively associated with the propensity to establish an additional foreign production subsidiary. Since they are significant, they support *Hypothesis 3.1*: As the number of host countries rises, the propensity to expand the network of production subsidiaries appears to first increase and then decrease.

The variable *labor cost development* is incorporated in Model 4 to test *Hypothesis 3.2a* and shows a significant, positive coefficient. The log likelihood increases to -258.54. As predicted by *Hypothesis 3.2a*, rising labor costs within the existing network seem to increase the propensity to establish an additional production subsidiary. Also, the introduction of *uncertainty of labor costs* in Model 5 improves the log likelihood (-262.53). The significantly positive coefficient supports

*Hypothesis 3.3a* stating that the uncertainty of labor costs in the established network of production subsidiaries increases the propensity to set up a new production site. In Model 6 *uncertainty of labor cost* is interacted with *diversity of labor cost developments* in order to test *Hypothesis 3.4a*. To calculate the interaction term, both variables were centered around zero. The log likelihood is significantly higher (-249.95) than in Model 5. The negative coefficient supports *Hypothesis 3.4a*: As the diversity of labor costs in the existing network of production subsidiaries creates operational flexibility that is valuable under uncertainty, it diminishes the positive influence of uncertainty on the propensity to establish an additional production subsidiary. The hypothesized influences remain stable in the complete Model 7.

### 3.4.2 Cost and flexibility improvement of the production network

The previous analysis centered on the cost and flexibility characteristics of the existing production network whilst ignoring the quality of the potential new locations. We now address the question of whether the 245 firms that decided to invest selected a location that increased the net present value and the flexibility value of the production network. Table 3.4 provides a country breakdown of the chosen locations. To ensure confidentiality, all numbers referring to less than four investment objects are concealed.

In order to test *Hypotheses 3.2b, 3.3b,* and *3.4b,* we introduce the variables *change in labor cost development, change in uncertainty of labor costs* and *change in diversity of labor cost developments*. They indicate the relative change effectuated by the

expansion. We employ Student t tests to check whether the changes are significant. Table 3.5 presents the results.

Table 3.4: Number of additional production subsidiaries in the sample per host country

| Country | Number of additional subsidiaries |
|---|---|
| Austria | 11 |
| Azerbaijan | < 4 |
| Belgium | 10 |
| Bulgaria | < 4 |
| Czech Republic | 26 |
| Denmark | < 4 |
| Finland | < 4 |
| France | 28 |
| Hungary | 10 |
| Ireland | < 4 |
| Italy | 21 |
| Luxembourg | < 4 |
| Netherlands | 8 |
| Norway | 5 |
| Portugal | < 4 |
| Russian Federation | 17 |
| Slovak Republic | 14 |
| Spain | 24 |
| Sweden | 6 |
| Switzerland | 14 |
| Turkey | 9 |
| Ukraine | 4 |
| United Kingdom | 23 |
| Total | 245 |

Table 3.5: T test of changes in the cost and flexibility characteristics of the international production network

| *Variable* | Obs. | Mean | Std. Dev. | Pr(T > t) | Pr(T < t) |
|---|---|---|---|---|---|
| *change in diversity of labor cost developments* | 245 | 3.8492 | 36.1632 | 0.0485 | 0.9515 |
| *change in uncertainty of labor costs* | 245 | 8.9850 | 45.3774 | 0.0011 | 0.9989 |
| *change in labor cost development* | 245 | -0.3046 | 0.4303 | 1.0000 | 0.0000 |

The *change in labor cost development* is significant and negative. As we predicted in *Hypothesis 3.2b*, investors seem to establish an additional foreign production subsidiary in a location that decreases the labor cost growth within the country portfolio. By contrast, the *change in uncertainty of labor costs* indicates a positive change; i. e. investors do not appear to avoid entries to locations with volatile wages. We have to reject *Hypothesis 3.3b. Hypothesis 3.4b* states that investors will choose a location that contributes to a greater diversity of labor cost developments within the production network. Its prediction is supported by the significant positive *change in diversity of labor cost developments*.

## 3.5 Discussion

Our analysis of international production networks of German firms suggests that the operational flexibility provided by an existing set of locations is an important decision determinant for the establishment of an additional production site. The potential of a production network to provide operational flexibility appears to rise by its size, even though additional locations make decreasing marginal contributions to operational flexibility. Furthermore, for an international production network to provide operational flexibility, the factor costs in the locations must not change in parallel. The results show that MNCs tend to stay with production locations with uncertain labor costs if the diversity of volatile labor cost movements in those countries is high. Rising and uncertain labor costs generally urge MNCs to enter complementary production locations that compensate for the cost deficiencies of the established facilities.

Earlier studies that investigated the establishment of additional foreign subsidiaries (including sales and other units) found a linear positive effect of the number of previous entries on the probability of subsequent investments (Chang, 1995; Delios & Henisz, 2003). Understanding the value of an international production network as the ability to shift capacities across countries, the benefit of adding foreign locations is limited. The findings of this analysis support the rationale that increasing coordination costs confine the MNC's propensity to further expand if the scope of the production network offers a sufficient amount of operational flexibility. Going beyond prior work on sequential foreign direct investment, our study contemplates the cost and flexibility characteristics of the foreign subsidiaries that have been established earlier. Rising and uncertain labor costs reduce the net present value of the production network and suggest enlarging it whereas the diversity of uncertain labor cost developments within the portfolio increases the flexibility value and diminishes the positive influence of uncertainty on the propensity to expand.

Research on foreign direct investment decisions has examined the characteristics of the host country to be chosen (Buckley, Devinney, & Louviere, 2007; Desbordes, 2007; Flores & Aguilera, 2007) and the investor's home country (Witt & Lewin, 2007) whilst paying little attention to the characteristics of the countries that have been chosen as locations before. Our investigation adds to this knowledge by stressing the importance of the existing multinational production network for efficiency-seeking investment decisions. Ex-ante, the analysis leaves characteristics of the target and location aside. Instead we regard the cost and flexibility characteristics of the existing network of production subsidiaries as influencing factors for the decision to establish an additional production site abroad. Once the decision on establishing a new

production subsidiary has been made, we show ex-post that its location helps improve the cost and flexibility characteristics of the extant production network. This finding suggests that the quality of a host country as a production location depends on the firm's present configuration of international production and is highly company-specific.

The fact that the location quality of host countries can be company-specific leads to a strong implication for management. The more diversified the international production system of an MNC, the less applicable are uniform tools (e. g. the BERI index) to assess foreign locations. In literature, factors that refer to individual locations dominate over flexibility considerations of the whole network as motives for locating production subsidiaries abroad. Managers should pay more attention to the operational flexibility contribution of additional facilities when expanding foreign production networks and choosing appropriate locations. Thus, a new production site should be evaluated by its strategic fit within the existing portfolio. Secondly, the results show that investors reduce their labor cost growth by establishing new production subsidiaries, whereas they seem to accept increasing uncertainty of labor costs. Managers should not only assess the current labor cost levels when choosing a foreign country as a production location but also their likely developments in the future.

Host country governments that seek to attract foreign direct investments need to be aware that each investor evaluates the country's appropriateness as a production location in an individual context. Positioning the own country against competing locations successfully requires having the country excel others concerning both general criteria and the distinct fit with the investor's existing locations. The more developed the international production network of the investor, the more difficult and

costly it can be to offer attractive conditions to the investor. The likely consequences are that governmental location marketing should be individualized for large investors and focused on those investors who can expect a contribution to operational flexibility from the new location.

The analysis has a number of limitations, some of which are due to missing information in the anonymous dataset. If we had more detailed information on the subsidiary level, we would be better able to differentiate between market-seeking and efficiency-seeking motives of foreign direct investment; the positive influence of *GDP growth* indicates that some of the production facilities also serve the local market. Furthermore, it would be possible to track outsourcing production capacity from contractors. Data restrictions made it difficult to investigate the influence of strategic motivations (e. g. access to specific resources or the need to follow important customers) for the propensity to establish an additional production subsidiary abroad. Neither were we able to distinguish greenfield investments from acquisitions (the latter of which can be instantly employed). Nevertheless, future research can build on the findings of the analysis to advance the theory of international production.

# 4. CONTRACTION OF INTERNATIONAL PRODUCTION NETWORKS

## 4.1 Research context

After analysing expansion decisions as strategies for improving the cost and flexibility conditions of an international production network, we will now investigate the role of operational flexibility in decisions to contract as a second means of network reconfiguration. As international divestment strategies involve massive capacity decisions for multinational corporations, they attract rising attention in international business research (Dhanaraj & Beamish, 2009). Viewing foreign affiliates as gateways to foreign demand and supply markets, research on international divestment has mainly identified factors of survival that relate to the individual subsidiary. The decision to divest, however, may also depend on the role played by the subsidiary in relation to other subsidiaries or to the MNC as a whole (Benito, 2005). If a candidate for closure is established as part of an integrated production network, the decision is subject to the characteristics of the remaining network as well (Belderbos & Zou, 2009). This chapter sheds light on the determinants of divestment decisions that refer to the configuration of international networks of production subsidiaries in different locations.

Many international ventures are divested for financial reasons (Jagersma & van Gorp, 2003). Accordingly, studies regard the closure of a foreign affiliate as a consequence of performing below expectations. Host country characteristics exert an influence on performance, and hence, the survival chance of the subsidiary. While economic and

industry growth decrease the propensity to divest (Benito, 1997; Mudambi & Zahra, 2007), competitor entry rates into the industry (Mata & Portugal, 2000; Mata & Portugal, 2002) and cultural distance from the home country (Barkema, Bell, & Pennings, 1996; Li & Guisinger, 1991) seem to increase it. On the subsidiary level, joint ventures are more often divested than wholly-owned subsidiaries (Delios & Makino, 2003; Ogasavara & Hoshino, 2008). Similarly, acquisitions show lower survival rates vis-à-vis greenfield investments (Li & Guisinger, 1991; Shaver, 1995). Furthermore, subsidiaries that add to a firm's product diversification have a lower chance of survival (Hennart, Kim, & Zeng, 1998; Li, 1995). Regarding parent firm characteristics, empirical studies revealed lower divestment rates for firms that possess host country experience (Li, 1995; Shaver, Mitchell, & Yeung, 1997) and technological advantage (Belderbos, 2003; Delios & Beamish, 2001). Confirming the rationale that parent companies divest affiliates which decrease the overall success of the firm, Haynes, Thompson, and Wright (2002) find (on a national level) that divestments improve a company's performance. Besides financial reasons, strategic motivations may drive international divestment decisions (Benito & Welch, 1997; Boddewyn, 1979). Makino et al. (2007) show that international joint ventures are terminated if their purposes have been achieved. In this case, the divestment is a strategic move of the corporate group rather than an outcome of the subsidiary's financial failure. Altogether, previous research has produced rich insights into the determinants of foreign subsidiary survival. Interrelations with other foreign production subsidiaries of the firm as influencing factors of the divestment decision have, however, been mostly disregarded.

The concept of operational flexibility states that a primary advantage of multinational

corporations is the flexibility to transfer resources, e. g. production capacity, between locations in different countries as a reaction to environmental changes (Kogut, 1985). Chung, Lu and Beamish (2008) highlight network characteristics that influence the survival of foreign subsidiaries. The study employs a composite figure that measures the network development incorporating the number of foreign subsidiaries and the number of host countries to express the importance of an individual subsidiary to the whole network. Several studies on international subsidiary closures account for properties of the international network in an implicit way as they include the number of foreign subsidiaries (Barkema, Bell, & Pennings, 1996; Benito, 1997) or the number of host countries (Yamawaki, 1997) as a measure of the investor's international experience. The results, however, are not congruent. One explanation may be that not only the size but also the configuration of an international production network determines a subsidiary's importance to the network. Belderbos and Zou (2009) use the concept of operational flexibility to identify factors of foreign manufacturing affiliate divestments. In contrast to Chung, Lu and Beamish (2008), they consider the characteristics of an international production network's set of host countries rather than the network size alone. The findings suggest that growing labor costs in a location and a correlation with the macroeconomic conditions in other locations increase the propensity to divest a foreign subsidiary. A differentiation between subsidiaries that are the sole investment in the target market and subsidiaries that are not the sole investment shows that, according to the logic of operational flexibility, location characteristics of the production network are only relevant to the decision of closure when the subsidiary exit involves a complete withdrawal from the location.

Our analysis seeks to extend this new stream of research based on the concept of operational flexibility by stressing the flexibility value of a location that is part of an international production network. Rising labor costs make a location less profitable and suggest shifting production elsewhere in the network. However, divesting this location would kill the opportunity to shift back production if cost conditions go into reverse. As long as the local labor market is flexible enough to allow for temporary capacity adjustments, investors are likely to hold the location even if labor costs are presently rising. Similarly, uncertain labor costs in a location complicate production planning and will generally induce investors to shift production to more stable locations. Nevertheless this location can be valuable for production shifting if its labor cost development is different from the remaining network. The aim of this analysis is to show that divestments of individual production locations depend on labor cost developments throughout the international production network and are less likely if they enhance the opportunity to shift production.

The next section of the chapter develops a model that predicts international divestment decisions drawing on cost and flexibility characteristics of an international production network. In the third section, the empirical research design will be described before the results of the empirical analysis are presented in section four. The fifth section concludes the chapter with a discussion of the findings.

## 4.2 Theoretical development

We build a model of the decision to withdraw from a country as a production location that is part of an international network. The value $V$ of this location consists of two

elements: its net present value *NPV* and its flexibility value *F*.

$$V=NPV+F$$

Both values are influenced by the actual cost development $\mu$ and its uncertainty $\sigma$ in the production network. Growth and unpredictability of costs make a production location less efficient and, therefore, directly affect the *NPV.* The flexibility value *F* reflects an MNC's potential to adjust its production process according to $\mu$ and $\sigma$. Given an MNC's need *N* to react to changing conditions, *F* is determined by the opportunity *O* to do it by capacity adjustments in the focal production location.

$$V=NPV(\mu,\sigma) + N(\mu,\sigma) * O$$

Labor cost advantages of foreign countries are a major motivation to establish production sites outside the home market (e.g., Dunning & Lundan, 2008). Studies also show that higher wage rates prevent investors from entering a foreign market (Bellak & Leibrecht, 2009; Carstensen & Toubal, 2004). International investors do not, however, expect favorable cost conditions to be permanent. Labor costs may rise dramatically when a large number of MNCs locate production facilities in a certain country because labor is relatively cheap. Since rising labor costs have a negative impact on foreign subsidiary performance (Chan, Isobe, & Makino, 2008), firms try to reduce the cost of production. They enhance productivity through technology and training, thus cost-efficient production is also possible in high-wage countries (Mucchielli & Saucier, 1997). However, if cost savings do not suffice to recover production efficiency, the MNC is prone to consider different locations as substitutes for former low cost countries that have become too expensive and relocate its production to countries that offer more favorable cost conditions. Rising labor costs

will generally lower the net present value *NPV* of a production location and make it less attractive to the investor.

*Hypothesis 4.1a: Rising labor costs increase the propensity to leave a country as a production location.*

Since the divestment decision is made in a network perspective, the question of whether or not to leave a host country is also contingent on labor cost developments in alternative locations. Belderbos and Zou (2007) confirm that MNCs adjust their workforce in one host country as a consequence of cost developments in the other locations of the production network. Rising labor costs in other locations make the focal production location relatively more valuable and influence the judgment of its *NPV*. We therefore assume that an MNC is less willing to eliminate a location from the network when labor cost developments in the other locations are unfavorable.

*Hypothesis 4.1b: Rising labor costs in the residual network reduce the propensity to leave a country as a production location.*

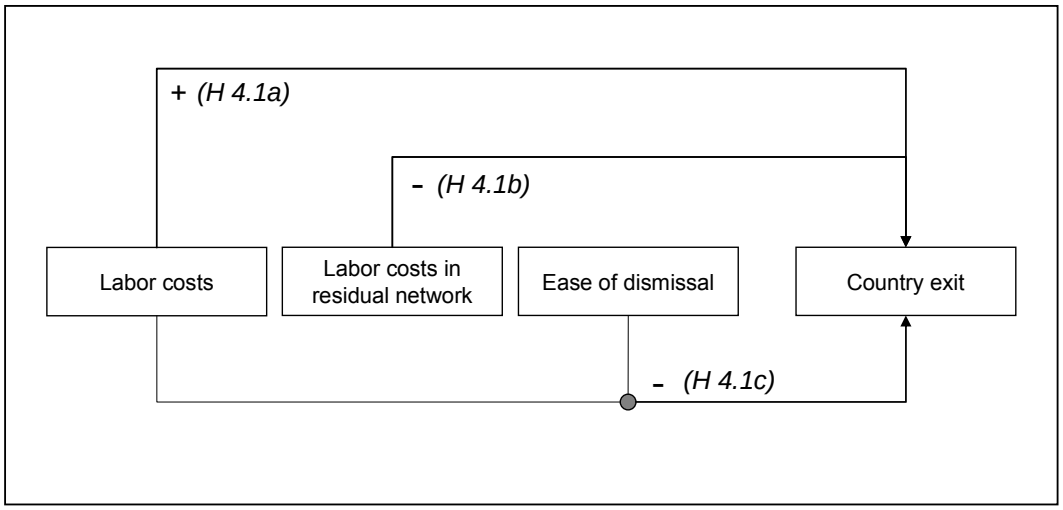
Rising labor costs influence the cost structure of an MNC and generate a need to react to those changes flexibly, that is, to shift production from a location that becomes relatively more expensive to a location that becomes relatively less expensive. When labor cost developments are different across countries, a location that becomes more expensive today may become attractive as a production location again in the future. Therefore, MNCs do not immediately react to rising labor costs by a complete withdrawal from the foreign location but rather with a reduction of the workforce (Belderbos & Zou, 2007). The opportunity to operate flexibly through dismissal of workers is contingent on the regulation of the local labor market. Countries exhibit

different intensities of labor market regulation and thus impose different costs on firms who dismiss workers, for example, in the form of complex legal requirements, severance payments, or long notice periods (World Bank, 2009). Previous findings suggest that investors do not seem to anticipate the costs that are associated with rigid labor markets (Leibrecht & Scharler, 2009). An MNC that has built an international network of production locations will only consider leaving a foreign country with rising labor costs if labor market regulations impede the opportunity to exercise operational flexibility and thus diminish the flexibility value *F* of the location. We put this argument in a positive way and expect that

> *Hypothesis 4.1c: Ease of employee dismissal reduces the effect of labor cost growth on the propensity to leave a country as a production location.*

The first set of propositions is summarized by Figure 4.1. It illustrates the hypothesized influences of *Hypotheses 4.1a*, *4.1b*, and *4.1c*.

Figure 4.1: Illustration of hypotheses on the propensity to withdraw from a host country I



The future developments of labor costs in a host country can be hard to predict. Wages may have volatile growth rates, especially in emerging economies that are often preferred as investment locations by firms who target low cost labor, for example, in Eastern Europe (International Labour Organization, 2009). The lack of predictability makes the choice of efficient manufacturing technologies and the design of cost-minimizing production processes difficult (de Meza & van der Ploeg, 1987). Labor-cost volatility leads to an extra discount on the cash flows that are going to be generated by the production sites in a country and decreases the net present value *NPV* of the foreign production location.

> *Hypothesis 4.2a: Uncertainty of labor costs increases the propensity to leave a country as a production location.*

Investors do not however build their divestment decisions only on the uncertainty of labor costs in a single country. They will also consider the cost predictability of other locations in the production network. Uncertain labor cost developments in the alternative locations will lead to a more positive judgment of the *NPV* of the focal production location and make it a less likely candidate for divestment.

> *Hypothesis 4.2b: Uncertainty of labor costs in the residual network reduces the propensity to leave a country as a production location.*

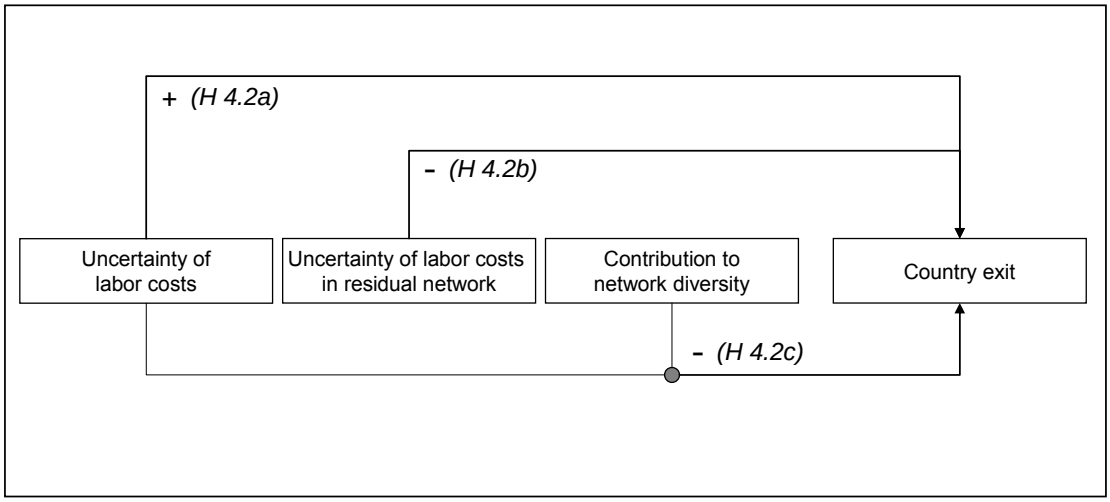
Volatile labor costs require an ongoing adjustment of international production flows by shifting capacities across countries. However, Chung et al. (2010) demonstrate that MNCs do not shift production internationally if macro-economic conditions among foreign locations are redundant, that is, when environments change in parallel. Belderbos and Zou (2009) show that multinational portfolio redundancy as the

correlation of exchange rates between an affiliate's host country and the other countries of the production network lead to a higher propensity to divest. Conversely, a location in which wage rates fluctuate in different directions than in the remaining locations provides an opportunity to shift production when there is a need for production shifting due to volatile labor costs. The contribution to the diversity of labor cost movements within the production network increases the flexibility value *F* of the focal location. Consequently, the propensity to divestment will be lower.

> *Hypothesis 4.2c: The contribution of a location to the diversity of labor cost developments in the network reduces the effect of uncertainty of labor costs on the propensity to leave a country as a production location.*

The second set of propositions is summarized by Figure 4.2. It illustrates *Hypotheses 4.2a*, *4.2b*, and *4.2c*.

Figure 4.2: Illustration of hypotheses on the propensity to withdraw from a host country II



## 4.3 Empirical methods

### 4.3.1 Data

We test our hypotheses on firm-level data of German manufacturing MNCs. The Central Bank of Germany maintains a database that comprises anonymous information about all foreign direct investment objects of German parent firms above a balance sheet total of € 3 million. The reports include balance sheets, the stock of foreign direct investment, and other characteristics of the foreign subsidiaries. They are available as panel data on an annual basis and are assigned to investors by consistent identification numbers from 1996 on. For this analysis, we closed the data set with definite figures from 2006 and preliminary figures from 2007. Besides firm-level data, we included country-level data of the World Bank, the International Labour Organization (ILO), and the World Economic Forum.

The Central Bank FDI database allows us to filter out the production affiliates of the German parent firms. Because of transportation and coordination costs, a low physical distance facilitates earning benefits from operational flexibility (Rugman & Verbeke, 2004). Like Belderbos and Zou's (2007) study that includes nine production locations of Japanese MNCs in the East Asian region, we limit the analysis of production subsidiaries to one geographical region. Our investigation centers on European production locations, since Europe is the most relevant production region of German MNCs, accounting for 56 % of their foreign production. The second reason that makes Europe an appropriate empirical environment is that MNCs evaluate factor costs in the currency of their home country, whilst exchange rate fluctuations superimpose international factor cost movements. In European production networks, exchange rate fluctuations play a minor role due to the euro (European Central Bank, 2007). The

levels and movements of labor costs among European countries, however, are very diverse (International Labour Organization, 2009), as are the levels of labor market regulation (World Bank, 2009).

In order to investigate complete withdrawals from foreign locations, we aggregated all the production subsidiaries an investor maintains in a country. Subsidiaries reporting negative equity and investors reporting no turnover of the corporate group were excluded from the analysis. We analyse withdrawals (if they occur) from production locations between 2002 and 2007 that had been entered after 1996. To exclude investment decisions that were rapidly retracted, the production location had to remain s in the investor's country portfolio for at least two consecutive years. To avoid a bias from firms that left the databank during the observation period, we included only parent firms that were under observation for the full period until 2007. We consider a set of production locations as an international network if it embraces subsidiaries in more than two European countries before the withdrawal from one location. We finally obtain a panel of 596 production locations of 189 German MNCs. Table 4.1 displays the countries and their frequency as production locations. To ensure confidentiality, all numbers referring to less than four observations are concealed.

### 4.3.2 Measures

*Dependent variable*

In accordance with the majority of studies on international divestment decisions on the subsidiary level (e.g., Dhanaraj & Beamish, 2009; Pan & Chi, 1999) we use a binary coding for the dependent variable *country exit*. It takes the value one in the

year in which an investor withdraws from a country as a production location, and zero otherwise. Within the period between 2002 and 2007, 143 country exits occurred among the 596 locations.

Table 4.1: Countries and their frequency included in the analysis

| Country | Frequency |
|---|---|
| Austria | 40 |
| Belgium | 24 |
| Bulgaria | < 4 |
| Czech Republic | 33 |
| Croatia | 4 |
| Denmark | 11 |
| Estonia | < 4 |
| Finland | 8 |
| France | 80 |
| Greece | 10 |
| Hungary | 24 |
| Ireland | 8 |
| Italy | 55 |
| Latvia | < 4 |
| Lithuania | < 4 |
| Moldova | < 4 |
| Netherlands | 25 |
| Norway | 6 |
| Poland | 42 |
| Portugal | 20 |
| Romania | 8 |
| Russian Federation | 5 |
| Slovak Republic | 14 |
| Spain | 76 |
| Sweden | 12 |
| Switzerland | 23 |
| Turkey | 19 |
| Ukraine | < 4 |
| United Kingdom | 38 |
| Total | 596 |

*Independent variables*

Labor cost developments in foreign locations were taken from the ILO's Key Indicators of the Labour Market (KILM) databank, 6$^{th}$ edition (2009). To calculate

*labor cost development*, we use the real manufacturing wage index as a basis, which is the nominal wages index corrected for changes in purchasing power measured by the consumer price index (100 * nominal wage index/consumer price index). We subtract the wage index of the previous year from the wage index of the present year to obtain the annual growth rate. To measure the *residual network's labor cost development* we calculate the mean growth rates across all other production locations of the MNC.

We also draw on the ILO real manufacturing wage index to measure *uncertainty of labor costs*. Like earlier studies that incorporate uncertainty by the volatility of a macroeconomic indicator (Campa, 2004; Folta & O'Brien, 2004), we use an autoregressive conditional heteroskedastic (ARCH) process (Engle, 1982) to estimate the degree to which the current wage index could not be predicted by the investors looking at past development. We compute the *residual network's uncertainty of labor costs* by the mean of labor cost uncertainties across all production locations of the MNC except the focal location.

The variable *contribution to network diversity* shall reflect the heterogeneity of labor cost developments added by the focal location to the whole production network. From the variance in real manufacturing wage growth rates across the full set of host countries in a year, we subtract the variance in the network without the focal location. A positive value indicates that the heterogeneity of labor cost developments is higher including the focal country, and a negative value means that the heterogeneity of the network is higher without that country.

The World Bank publishes the annual survey "Doing Business" that reports on business regulation and the protection of property rights as well as their effects on

businesses in 183 economies (World Bank, 2009). The data are useful for foreign investors to evaluate countries as investment targets and are often employed as indicators in empirical studies (e.g., Atanassov & Kim, 2009; Botero et al., 2004). In particular, the reports include information on national labor market regulations, which are provided by local lawyers and public officials. We invert the "difficulty of firing" index in order to measure *ease of dismissal*. The index contains eight components that describe how easily workers can be laid off, for example, whether redundancy is allowed as a basis for terminating workers or whether the employer needs to notify a third party to terminate a redundant worker.

*Control variables*

Previous research proposed a variety of factors on the host country, subsidiary, and parent firm level that influence international divestments. We check for these factors as far as data were available. Referring to host country characteristics, market growth proved to be an important location factor of international investment decisions (e.g., Buckley, Devinney, & Louviere, 2007) and divestment of foreign production subsidiaries (Benito, 1997). If production subsidiaries, among other markets, serve local demand, *GDP growth* (source: World Bank) should lower the propensity to withdraw from that country. Higher costs of imports make local production more attractive and will decrease the propensity to divest. In Europe, tariffs or import restrictions can be largely neglected. There are, however, costs for documents, administrative fees for customs clearance and technical control, terminal handling charges, and domestic transport. We measure those costs as *obstacles to imports*, which we also obtained from the "Doing Business" surveys of the World Bank. The

figures refer to the costs per 20-foot container in U.S. dollars. The overall political climate of the host country has a strong influence on the survival of foreign investment objects (Akhter & Choudhry, 1993; Hadjikhani & Johanson, 1996). In its annual executive opinion surveys (Schwab, 2009), the World Economic Forum raises the question whether the threat of terrorism imposes significant costs on business, which introduces a measure of the variable *political stability.* It ranges from one (high costs) to seven (low costs, i. e. highly stable). Cultural distance between the home and the host country may impede foreign business activities and has revealed a negative impact on subsidiary survival (Barkema, Bell, & Pennings, 1996; Li & Guisinger, 1991). We operationalize *cultural distance* using the extended list of cultural indices by Hofstede (1980). Following previous work (Chang & Rosenzweig, 2001), we calculate the square root of the sum of the squared differences between those four cultural dimensions of the respective host countries and Germany, divided by four. As higher cultural distance is likely to cause costs of coordination when exercising production flexibility, we expect a positive influence on the probability to withdraw from a foreign production location.

On the subsidiary level, performance indicators seem to be driving forces on the decision to divest an affiliate or not (Benito & Welch, 1997; Jagersma & van Gorp, 2003). In order to separate financial reasons for withdrawal from the strategic motivations of operational flexibility, we measure *profitability* of a foreign location by the average return on sales generated by the production subsidiaries within a country. We expect that the more profitable a foreign location, the lower is the propensity to leave this location. Since previous studies found that joint ventures show a higher probability of termination (Delios & Makino, 2003; Ogasavara & Hoshino, 2008), we

control for the average *equity share* of the investor's affiliates in a host country. Another factor that may influence divestment is the importance of the production location, which we measure by the (logarithmized) *sales volume* of the subsidiaries in a location. As sales reflect the potential of in-country advantages of scale and scope we expect that the divestment propensity will be lower when sales are high in a foreign location.

Regarding influence factors on the corporate level, previous research employs the number of host countries to account for network or learning effects as determinants of subsidiary survival (Yamawaki, 1997). We include the number of countries in which an investor maintains production subsidiaries by the variable *NOC* since the opportunity to operate flexibly tends to rise with the number of locations (Allen & Pantzalis, 1996; Lee & Makhija, 2009; Tang & Tikoo, 1999). The decision to withdraw from a country may be part of an overall restructuring process of the MNC. We therefore include the variable *number of previous country exits*, which captures the number of previous withdrawals from other foreign locations. Finally, we control for ownership of the corporate group. MNCs owned by private individuals or families exhibit internationalization strategies that are different from other ownership types (George, Wiklund, & Zahra, 2005; Zahra, 2003). Ownership may therefore affect international divestment decisions. We include the dummy variable *ownership* which has the value one if the firm is held by a domestic private individual or family, and zero otherwise. Table 4.2 summarizes the variables measurement and displays the descriptive statistics. Due to confidentiality policies, minimum and maximum values of firm-level variables need to refer to the average of the highest and lowest three observations.

Table 4.2: Variables measurement and descriptive statistics

| Name | Description | Mean | StdDev | Min | Max |
|---|---|---|---|---|---|
| *residual network's uncertainty of labor costs* | Residual network's average volatility of labor cost developments (estimated by ARCH models) | 70.34 | 76.08 | 0.67 | 561.8 |
| *uncertainty of labor costs* | Volatility of labor cost developments (estimated by ARCH models) | 53.79 | 128.01 | 0.54 | 1111 |
| *residual network's labor cost development* | Residual network's average real manufacturing wage growth | 4.82 | 11.05 | -38.1 | 57.8 |
| *labor cost development* | Real manufacturing wage growth | 3.14 | 19.24 | -59.3 | 97.7 |
| *contribution to network diversity* | Variance of wage growth rates across countries in the portfolio with vs. without focal location | -23.64 | 275.66 | -2681 | 2514 |
| *ease of dismissal* | Inverted "Difficulty of firing" index | 37.67 | 14.71 | 0 | 60 |
| *GDP growth* | GDP growth rate | 3.54 | 2.13 | -0.81 | 10.42 |
| *obstacles to imports* | Costs of importing | 1032.2 | 257.07 | 420 | 2050 |
| *political stability* | Inverted "Business costs of terrorism" | 5.07 | 0.65 | 3.80 | 6.50 |
| *cultural distance* | Cultural distance to Germany | 2777 | 1571 | 611 | 8746 |
| *profitability* | Average return on sales within a host country | 0.04 | 0.12 | -0.63 | 0.73 |
| *equity share* | Average equity share within a host country | 0.93 | 0.17 | 0.15 | 1 |
| *sales volume* | Log of sales within a host country | 11.04 | 1.53 | 7.60 | 15.78 |
| *NOC* | Number of host countries | 7.18 | 5.59 | 3 | 29 |
| *number of previous country exits* | Number of previous withdrawals from other foreign locations | 3.28 | 3.00 | 1 | 20 |
| *ownership* | Dummy (=1 if the firm is held by a domestic private individual or family) | 0.28 | 0.45 | 0 | 1 |

Number of observations: 596

## 4.4 Results

The correlation matrix in Table 4.3 reveals that the variables are mostly independent of each other. There is a strong correlation between *uncertainty of labor costs* and *labor cost development* as well as *residual network's uncertainty of labor costs* and *residual network's labor cost development,* which indicates that locations that feature high wage growth rates are also more unpredictable in their wage developments.

Table 4.3: Correlation matrix and variance inflation factors

| | Variable | *1* | *2* | *3* | *4* | *5* | *6* | *7* | *8* | *9* | *10* | *11* | *12* | *13* | *14* | *15* | *16* | VIF |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| *1* | *residual network's uncertainty of labor costs* | 1 | | | | | | | | | | | | | | | | 3.27 |
| *2* | *uncertainty of labor costs* | -0.02 | 1 | | | | | | | | | | | | | | | 3.22 |
| *3* | *residual network's labor cost development* | 0.79 | 0.02 | 1 | | | | | | | | | | | | | | 2.80 |
| *4* | *labor cost development* | 0.04 | 0.68 | 0.03 | 1 | | | | | | | | | | | | | 2.38 |
| *5* | *contribution to network diversity* | -0.40 | 0.38 | -0.22 | 0.12 | 1 | | | | | | | | | | | | 1.56 |
| *6* | *ease of dismissal* | 0.02 | 0.10 | 0.01 | 0.07 | 0.06 | 1 | | | | | | | | | | | 1.13 |
| *7* | *GDP growth* | 0.12 | 0.37 | 0.14 | 0.37 | 0.05 | 0.06 | 1 | | | | | | | | | | 1.66 |
| *8* | *obstacles to imports* | -0.11 | 0.16 | -0.09 | 0.15 | 0.09 | 0.16 | -0.17 | 1 | | | | | | | | | 1.33 |
| *9* | *political stability* | 0.03 | 0.09 | 0.03 | 0.11 | 0.08 | -0.11 | 0.02 | -0.20 | 1 | | | | | | | | 1.39 |
| *10* | *cultural distance* | 0.07 | -0.05 | 0.02 | 0.25 | -0.01 | 0.19 | 0.32 | 0.07 | 0.32 | 1 | | | | | | | 1.84 |
| *11* | *profitability* | 0.09 | 0.02 | 0.08 | 0.02 | 0.01 | -0.02 | 0.03 | -0.03 | 0.15 | 0.03 | 1 | | | | | | 1.08 |
| *12* | *equity share* | -0.04 | -0.11 | -0.06 | -0.05 | -0.03 | 0.06 | -0.06 | 0.08 | -0.02 | 0.07 | -0.09 | 1 | | | | | 1.07 |
| *13* | *sales volume* | 0.07 | -0.01 | 0.11 | 0.00 | 0.02 | 0.00 | -0.01 | 0.00 | -0.01 | 0.02 | 0.11 | 0.03 | 1 | | | | 1.18 |
| *14* | *NOC* | 0.16 | 0.13 | 0.09 | 0.08 | 0.05 | 0.00 | 0.13 | -0.04 | 0.09 | -0.03 | 0.14 | 0.06 | 0.26 | 1 | | | 2.05 |
| *15* | *number of previous country exits* | 0.07 | 0.36 | 0.03 | 0.29 | 0.12 | 0.09 | 0.38 | -0.13 | 0.18 | 0.15 | 0.11 | 0.03 | 0.13 | 0.64 | 1 | | 2.38 |
| *16* | *ownership* | -0.08 | -0.03 | -0.03 | -0.02 | 0.02 | 0.01 | -0.03 | -0.01 | 0.04 | 0.08 | 0.05 | 0.09 | -0.29 | -0.28 | -0.21 | 1 | 1.07 |

The positive correlation between *number of previous country exits* and *NOC* is evident; however, we decided to integrate both variables as controls since their impact on divestment decisions may be different. With a mean of 1.85, the variance inflation factors (VIF) indicate an acceptable level of multicollinearity.

Hazard rate models are an appropriate means for analysing the survival of investment objects (e.g., Chen & Wu, 1996; Dhanaraj & Beamish, 2009; Zaheer & Mosakowski, 1997). The hazard rate is defined as the probability that a certain event, for example, the termination of an international venture, will occur within a given time interval divided by the length of that interval. We employ a hazard model that is implemented in non-parametric regressions (Cox, 1972). It delivers an efficient estimation of the hypothesized influences on the decision to exit a foreign production location even though we have no assumption about the baseline hazard. The regression results are presented in Tables 4.4a and 4.4b.

Model 1 is the base model. It includes the control and moderating variables with a log likelihood of -825.26. Looking at the country-level variables, the results correspond to existing studies. *GDP growth* exerts a stable negative influence on the propensity to withdraw from a foreign location. The impact of *obstacles to imports* and *political stability* is also negative and mostly stable. *Cultural distance* has a positive influence on the propensity to divest a foreign production location in the full model only. On the subsidiary level, *profitability* proves to prevent exit from a foreign country. In agreement with previous findings on the divestment of joint ventures, a higher *equity share* of the affiliates in the host country is associated with a lower propensity to divestment.

Table 4.4a: Cox hazard rate regressions of the propensity to withdraw from a host country I

| *country exit* | Model 1 | Model 2 | Model 3 | Model 4 |
|---|---|---|---|---|
| *uncertainty of labor costs X contribution to network diversity residual network's uncertainty of labor costs* | | | | |
| *uncertainty of labor costs* | | | | |
| *labor cost development X ease of dismissal* | | | | -0.0016*** (0.0005) |
| *residual network's labor cost development* | | | -0.0308*** (0.0086) | |
| *labor cost development* | | -0.0009 (0.0058) | | 0.0022 (0.0057) |
| *contribution to network diversity* | 0.0007 (0.0005) | 0.0007 (0.0005) | 0.0004 (0.0005) | 0.0010** (0.0005) |
| *ease of dismissal* | -0.0166*** (0.0063) | -0.0164** (0.0064) | -0.0155** (0.0063) | -0.0160** (0.0064) |
| *GDP growth* | -0.4739*** (0.0700) | -0.4742*** (0.0703) | -0.4428*** (0.0694) | -0.5696*** (0.0775) |
| *obstacles to imports* | -0.0016*** (0.0004) | -0.0016*** (0.0004) | -0.0018*** (0.0004) | -0.0021*** (0.0004) |
| *political stability* | -0.3764** (0.1678) | -0.3729** (0.1694) | -0.2933* (0.1683) | -0.2137 (0.1761) |
| *cultural distance* | 2.63E-5 (8.17E-5) | 2.68E-5 (8.32E-5) | 1.96E-5 (8.24E-5) | 0.0001 (0.0001) |
| *profitability* | -1.5406*** (0.5626) | -1.5413*** (0.5629) | -1.5925*** (0.5789) | -1.612*** (0.5655) |
| *equity share* | -0.8843* (0.4646) | -0.8868* (0.4647) | -0.9011* (0.4624) | -0.7508 (0.4646) |
| *sales volume* | -0.1620** (0.0628) | -0.1616** (0.0629) | -0.1425** (0.0632) | -0.1427** (0.0632) |
| *NOC* | -0.0496* (0.0271) | -0.0502* (0.0274) | -0.0419 (0.0275) | -0.0562** (0.0275) |
| *number of previous country exits* | 0.0953* (0.0515) | 0.0965* (0.0523) | 0.0818 (0.0521) | 0.1144** (0.0540) |
| *ownership* | -0.3777* (0.2058) | -0.3789* (0.2060) | -0.4366** (0.2069) | -0.3861* (0.2080) |
| Log likelihood | -825.26 | -825.24 | -818.68*** | -820.85*** |
| Reference | no (base model) | Model 1 | Model 1 | Model 2 |
| Objects | 596 | 596 | 596 | 596 |

Standard errors in parentheses; *** p < 0.01; ** p < 0.05; * p < 0.1

The flexibility perspective provides an additional argument that joint ventures are more likely to be shut down: Operating a production facility with a partner makes decisions on capacity adjustment more complex since a local partner might be reluctant to degrade the joint venture. The negative influence of *sales volume* suggests that the more important a host country for an investor, the less likely is its elimination from the portfolio. On the corporate level, the size of the production network seems to impede divestment, while preceding divestment decisions concerning other locations tend to have a negative influence on further divestment. *NOC* and *number of previous country exits* are, however, rather unstable throughout the models. Finally, *ownership* exerts a negative influence on divestment, which may be attributed to more cautious internationalization paths of private owners. The moderator variable *contribution to network diversity* is mostly insignificant whereas *ease of dismissal* seems to deter withdrawal from a foreign country.

In Model 2, the variable *labor cost development* is introduced in order to test *Hypothesis 4.1a*. The coefficient is not significant. Therefore, we reject our first Hypothesis. Model 3 incorporates the variable *residual network's labor cost development* to test *Hypothesis 4.1b*. It raises the log likelihood to -818.68 and has a significant negative coefficient, which supports the prediction that rising labor costs in the remaining countries of the production network lower the divestment propensity in the focal location. In Model 4, *labor cost development* is interacted with *ease of dismissal.* For interactions, variables were centered around zero. The log likelihood of Model 4 is significantly higher than in Model 2 (-820.85). The coefficient is negative, which supports *Hypothesis 4.1c*. The opportunity to react to deteriorating cost conditions by capacity reduction seems to prevent withdrawal from locations with rising labor costs.

Table 4.4b: Cox hazard rate regressions of the propensity to withdraw from a host country II

| *country exit* | Model 5 | Model 6 | Model 7 | Model 8 |
|---|---|---|---|---|
| *uncertainty of labor costs X contribution to network diversity* | | | -1.59E-5* (8.65E-6) | -2.56E-5** (1.07E-5) |
| *residual network's uncertainty of labor costs* | | -0.0048*** (0.0018) | | -0.0012 (0.0023) |
| *uncertainty of labor costs* | 0.0013 (0.0013) | | 0.0039** (0.0018) | 0.0065*** (0.0019) |
| *labor cost development X ease of dismissal* | | | | -0.0022*** (0.0006) |
| *residual network's labor cost development* | | | | -0.0290** (0.0117) |
| *labor cost development* | | | | 0.0003 (0.0076) |
| *contribution to network diversity* | 0.0006 (0.0004) | 0.0002 (0.0005) | 0.0006 (0.0005) | 0.0004 (0.0006) |
| *ease of dismissal* | -0.0180*** (0.0065) | -0.0158** (0.0064) | -0.0203*** (0.0067) | -0.0197*** (0.0067) |
| *GDP growth* | -0.4918*** (0.0722) | -0.4609*** (0.0698) | -0.5051*** (0.0712) | -0.6032*** (0.0784) |
| *obstacles to imports* | -0.0017*** (0.0004) | -0.0018*** (0.0004) | -0.0016*** (0.0004) | -0.0025*** (0.0004) |
| *political stability* | -0.4270** (0.1764) | -0.3281* (0.1685) | -0.5127*** (0.1844) | -0.2243 (0.1874) |
| *cultural distance* | 3.86E-5 (8.23E-5) | 4.61E-5 (8.19E-5) | 4.26E-5 (8.12E-5) | 0.0002** (0.0001) |
| *profitability* | -1.5042*** (0.5625) | -1.3946** (0.5662) | -1.5353*** (0.5675) | -1.6571*** (0.5957) |
| *equity share* | -0.8627* (0.4659) | -0.9509** (0.4619) | -0.8263* (0.4672) | -0.6060 (0.4709) |
| *sales volume* | -0.1611** (0.0628) | -0.1663*** (0.06235) | -0.1647*** (0.0633) | -0.1226* (0.0646) |
| *NOC* | -0.0478* (0.0271) | -0.0341 (0.0277) | -0.0468* (0.0273) | -0.0477* (0.0287) |
| *number of previous country exits* | 0.0832 (0.0528) | 0.0846 (0.0528) | 0.0844 (0.0523) | 0.0829 (0.0556) |
| *ownership* | -0.3758* (0.2057) | -0.4304** (0.2057) | -0.3746* (0.2075) | -0.4340** (0.2110) |
| Log likelihood | -824.87 | -820.58*** | -822.36** | -807.49*** |
| Reference | Model 1 | Model 1 | Model 5 | Model 1 |
| Objects | 596 | 596 | 596 | 596 |

Standard errors in parentheses; *** p < 0.01; ** p < 0.05; * p < 0.1

The variable *uncertainty of labor costs* is added in Model 5 (Table 4.4b). The coefficient is not significant and does not support *Hypothesis 4.2a*. Model 6 tests *Hypothesis 4.2b* by introducing the variable *residual network's uncertainty of labor costs*. The coefficient is negative and significant (log likelihood -820.58). The unpredictability of labor costs of the remaining locations seems to prevent divestment of the focal location. However, due to its strong correlation with *residual network's labor cost development* it loses significance in the full model (Model 8). Model 7 includes the interaction term of *uncertainty of labor costs* and *contribution to network diversity*, which effectuates a significant improvement of the log likelihood to -822.36. The interaction term is negative and significant, providing support for *Hypothesis 4.2c*. The opportunity to shift production between the focal location and other countries with opposite labor cost developments lowers the propensity to leave a country with uncertain labor costs. Since *uncertainty of labor costs* becomes significantly positive in Model 7 as well as in the full model, *Hypothesis 2a*, which predicts that the unpredictability of labor costs enforces divestment decisions, is partly supported.

## 4.5 Discussion

Besides the known factors of international divestment, benefits from operational flexibility appear to govern a firm's decision to withdraw from a location. This chapter complements the findings of prior work that network size (Chung, Lu, & Beamish, 2008), labor cost growth, and host-country redundancy (Belderbos & Zou, 2009) influence divestment decisions regarding operational flexibility. It shows that the effect of labor cost growth in the focal location is reduced by the ease of reducing its production capacity for the time being. Thus, the location will be available for

reverse labor cost movements in the future. The analysis further shows that labor cost uncertainty is acceptable if the focal location shows a labor cost development that is different from the developments in the residual network. Under these circumstances, the location provides the firm with operational flexibility.

Previous studies mostly identified factors that determine the survival of single international affiliates. This literature, however, gives little attention to the flexibility value of these affiliates as part of an international production network. On the one hand, our study of the European production networks of German MNCs confirms those findings concerning GDP growth and political conditions (Benito, 1997) and concerning the share of investment in the foreign affiliate (Li, 1995; Ogasavara & Hoshino, 2008). Besides including these factors as indicators of subsidiary performance, we explicitly control for financial performance and find that it exerts a strong negative influence on divestment propensity, while the influences of the other factors remain stable.

On the other hand, the concept of operational flexibility suggests viewing foreign affiliates not only as independent entities that serve local supply or demand markets but also as a set of interrelated units that enable the firm to react flexibly to changing cost conditions (Kogut, 1985). In this perspective, divestment decisions depend on cost developments both in the focal location and in the remaining locations (Belderbos & Zou, 2007). This chapter reveals that investors base their decision to completely withdraw from a host country on cost developments in the whole network of production facilities. It further suggests that rising and uncertain wages decrease the net present value of a production location, whereas they increase the flexibility value of a location if firms can easily adjust their local workforce and if the location

contributes to the heterogeneity of wage developments in the network.

Investors who have to decide on international divestments may base their decisions on diverse information. Our analysis revealed that those decisions are not only driven by the most evident reason – the foreign investment's financial performance – but also by the production location strategy of a firm. We find that labor cost characteristics of the focal location and the other locations of the production network are strong predictors for a firm's international divestment decisions. When evaluating a country as a candidate for divestment, managers ought to consider the flexibility value of a location: They should take into account the rigidity of the local labor market as well as the location's fit into the existing network's wage developments, i. e. the location's contribution to the heterogeneity of labor cost developments. Long-term oriented investors should not hastily withdraw from a host country when labor cost developments temporarily turn adverse if the foreign location provides the flexibility needed for an international production shifting strategy. Rather, they should keep the location in their portfolio since international cost conditions may change rapidly and the location might offer the potential for taking over production tasks from other countries.

Since host country governments have an interest in keeping foreign investors in the country, the analysis also has political implications. First, labor markets should be flexible in order to benefit from the employment effect of foreign investors. Administrative and regulative obstacles to the dismissal of workers impose costs on investors who intend to adjust their workforce. If they cannot reduce capacity to the desired level, they are more likely to completely withdraw from the location. In contrast, if the host country government allows for temporary workforce reductions,

investors will stick to the location for later re-investments. Secondly, host country governments need to be aware that investors evaluate a country's quality as a production location by its fit with other locations in the country portfolio, which is different for each investor. Efforts to influence labor cost developments, for example, tax concessions or subsidization of wages, are ineffective if investors base the decision to exit a host country on its ability to contribute to the operational flexibility of the network.

Future research may build on the findings of this analysis and overcome its limitations, some of which are due to missing information in the anonymous dataset. Studies should incorporate more factors that have been examined by extant research into international divestment decisions. In the present data, we have no information on product diversification of the foreign subsidiary in relation to the parent company. Further, there is no distinction between greenfield investments and acquisitions, and no information on a parent firm's or subsidiary's competitive advantage, e. g. R&D or advertising intensity. Neither could we judge whether strategic motivations, other than production shifting, triggered the divestment decision.

# 5. PERFORMANCE EFFECTS OF EXPANSION AND CONTRACTION OF INTERNATIONAL PRODUCTION NETWORKS

## 5.1 Research context

After analysing the conditions that induce firms to reconfigure their international production network through adding new or withdrawing existing locations from the portfolio, we now want to investigate the factors that determine the success of restructuring decisions that are based on operational flexibility. Improved efficiency of the international production network will lead to a better performance in the long-run (Buckley & Casson, 1998). However, it is unclear whether a long-term oriented reconfiguration of a portfolio of locations will also lead to an increase in performance in the short-run. Restructuring involves massive capacity decisions which immediately cause costs, while the benefits may not deliver performance improvements until a certain period of time has passed (Bergh, 1998). When firms establish an international production network in order to exploit operational flexibility, the performance effects of restructuring depend on the changed flexibility characteristics of the network as a whole. Improved conditions for shifting capacities within the network allow more efficient exploitation of operational flexibility and, therefore, might reveal positive performance effects of the restructuring even in the short-run. This chapter seeks to examine whether positive effects of international restructuring decisions, due to improved flexibility characteristics within a production network, can immediately outweigh the costs of restructuring.

Empirical studies that investigate the performance effects of an international network configuration that provides operational flexibility have mainly employed the number of host countries (breadth of internationalization) to capture the potential for shifting activities across borders. Maintaining several subsidiaries in one host country, however, creates coordination costs for each site, while there is no additional alternative for shifting capacity. Hence, studies find that firms that maximize breadth rather than depth (concentration of subsidiaries in few host countries) have a higher market valuation than their domestic peers or firms with alternative configurations (Allen & Pantzalis, 1996; Lee & Makhija, 2009; Tang & Tikoo, 1999). The stock market seems to favor network configurations that offer more flexibility to shift production capacities across borders. Those studies take a static view on the benefits of an international network configuration. However, MNCs are faced with the need to restructure their international portfolio in order to obtain optimal conditions for shifting capacities. That raises the question of potential performance outcomes of a network reconfiguration.

Firms must regularly confront decisions on restructuring their activities. Research has delivered a broad array of results concerning the determinants and outcomes of organizational, financial, and portfolio restructuring decisions (Bowman & Singh, 1993). While the stock market immediately reacts positively to restructuring decisions if they seem to be an appropriate means to respond to performance declines (Byerly, Lamont, & Keasler, 2003; Denis & Kruse, 2000), effects on financial performance might at first be negative before they turn positive (Kang & Shivdasani, 1997). Insights into the performance outcomes of restructuring an international portfolio through integrating new or leaving foreign locations are missing to date.

This analysis aims to make some progress in that direction by investigating the performance effects of firms' international restructuring activities. Building on the concept of operational flexibility, we want to clarify whether international reconfiguration decisions that enhance the flexibility to shift resources across the locations of a multinational production network can outweigh the costs of restructuring in the short-run. Flexibility to shift activities is offered by different characteristics of the production network. Besides the opportunity to shift capacities, the costs of altering production processes as well as the costs of transferring intermediate and final goods across borders within the network determine the efficiency of exploiting operational flexibility. The analysis complements existing research that considers performance outcomes of international network configurations in a static view as well as findings regarding the performance effects of a firm's restructuring decisions.

In the next section we build a model that incorporates the flexibility characteristics of a multinational production network that influence the performance outcomes of reconfiguring this network through host country entries and exits. The third section describes the empirical research design before the results of the econometric analysis are presented in section four. In the last section the results are discussed.

## 5.2 Theoretical development

Changing external conditions confront firms with the need to regularly revise their activities and to restructure them if necessary. On the organizational level, they may change the internal organization structure to increase efficiency of management teams; on the financial level, the capital structure can be changed, for example,

through buying back stock from equity investors; on the portfolio level, lines of businesses may be acquired or divested (Bowman & Singh, 1993). The performance outcomes of international investment and divestment decisions, as part of portfolio restructuring, are not unambiguous (Wu & Delios, 2009). Whereas portfolio restructuring decisions based on rational long-term strategy development are expected to show positive performance effects after a certain period of time (Chang, 1996), they incur costs in the moment when they are implemented.

Heugens and Schenk (2004) identify three groups of forces that inhibit organizational change and impede corporate restructuring. Firstly, organizations have a distinctive competence for producing complex products or services and have specialized departments for recording how resources have been used as well as for reconstructing sequences of decisions (Hannan & Freeman, 1984). These firm characteristics can lead to a loss of efficiency in the moment of restructuring. Secondly, organizations are influenced by institutions that structure and regulate the operating environment (DiMaggio & Powell, 1983). Governmental and industry regulations as well as the educational system are examples of institutions that determine the activities of a firm. When organizations engage in radical strategic change, the discrepancy between their actual structure and the institutionally prescribed ideal can lead to a loss of legitimacy and reputation in the short-run. Thirdly, organizations are influenced by external stakeholders (Donaldson & Preston, 1995). The relationships with stakeholders, for example, customers, are a specific combination of the involved parties. Stakeholder and firm can influence each other, in contrast to institutions such as public authorities, which influence the firm. A restructuring decision might disturb a more or less stable equilibrium between a firm and its external stakeholders in the short-run. The need to maintain this equilibrium can represent an obstacle to far-reaching change.

These three groups of forces that impede restructuring are most pronounced in the moment of reorganization and will ease in the course of time. If new production locations are integrated into a network, organizational routines will change and new relationships to institutions and stakeholders will have to be established. If locations are withdrawn from the portfolio, the organizational structure of the remaining network will have to be revised to compensate for the divested part. Further, leaving host countries might also negatively impact the relations to institutions and stakeholders in other foreign locations. We expect that the more radical the decisions on restructuring an international portfolio of production locations, the stronger will be their negative impacts on performance of an MNC in the moment when they are implemented.

> *Hypothesis 5.1: The more an international production network is reconfigured, the lower will be its performance in the short-run.*

An MNC that maintains an international production network in order to exploit the potential of operational flexibility has to ensure that the network offers the flexibility needed to shift labor capacities. If there is potential to improve the flexibility to shift capacity, the MNC should change the network configuration. The flexibility to react to changing labor costs within the production network is determined by three characteristics: the opportunity to react to cost changes, the costs that are associated with altering production processes within the network, and the costs that are associated with transferring intermediate and final goods across the locations of the network. MNCs that restructure their international production network in order to improve the three flexibility characteristics will have more potential to benefit from the exploitation of operational flexibility.

The opportunity to react to labor cost developments is contingent on the interdependencies of cost developments within all locations of the network. Chung et al. (2010) demonstrate that MNCs do not shift production internationally if macro-economic conditions among the foreign locations are redundant, as environments change in parallel. Belderbos and Zou (2009) show that multinational portfolio redundancy, measured as the correlation of exchange rates between an affiliate's host country and the other countries of the production network, leads to a higher propensity to withdraw from that location. Therefore, flexibility is higher when there is diversity of labor cost developments across the locations, that is, growth rates of wages fluctuate in different directions in the individual countries of the production network. We expect that the more a network configuration is altered, the more an increased diversity of cost developments can offset the costs that are associated with the reconfiguration of a production network.

> *Hypothesis 5.2: The more an international production network is reconfigured, the more firms will benefit from increased diversity of labor cost developments within the network in the short-run.*

The costs associated with altering production processes are determined by the costs for quantitative and qualitative adjustments of workforce within the network. The costs of increasing and reducing the number of employees in a location – quantitative adjustment – depend on the legal provisions of the local labor market (Pull, 2008). Countries exhibit different intensities of labor market regulations and thus impose different costs on firms that adjust labor capacity in a location (World Bank, 2009). When enlarging capacity, firms may face prohibition or maximum duration of fixed-term contracts for new employees. Countries also differ in relation to restrictions of

night and weekend work, maximum hours of the working week, and overtime. When dismissing workers, different costs occur due to notification and approval requirements, severance payments, or priority rules. Higher institutional regulations regarding the quantitative adjustment of labor capacity will lead to higher costs of altering the multinational production process. Therefore, we expect that the more MNCs restructure their international production network in a way that quantitative adjustments of labor capacity become less expensive, the more they will benefit from restructuring immediately.

> *Hypothesis 5.3a: The more an international production network is reconfigured, the more firms will benefit from increased labor market flexibility within the network in the short-run.*

Besides costs of quantitative adjustments of labor capacity within a network, shifting of capacity generates costs of qualitative adjustments in the individual locations. A well-qualified workforce may have fewer problems in coping with changing requirements when firms alter production outputs or processes in the focal location (Geishecker, Goerg, & Munch, 2010; Pull, 2008). When capacity in a location is increased, new (untrained) workers have to be hired. When capacity in a location is reduced, the remaining workers have to fulfill other tasks to maintain the production process on a lower scale. Workers that are less versatile generate costs for additional trainings in the individual plants and higher costs relating to deficient products. The more often the MNC alters its production schedule within the network of production locations, the more costs may occur when the workforce has not sufficient ability to react flexibly to changing demands within the production process. We expect that the more the international configuration is changed, the better firms are able to benefit

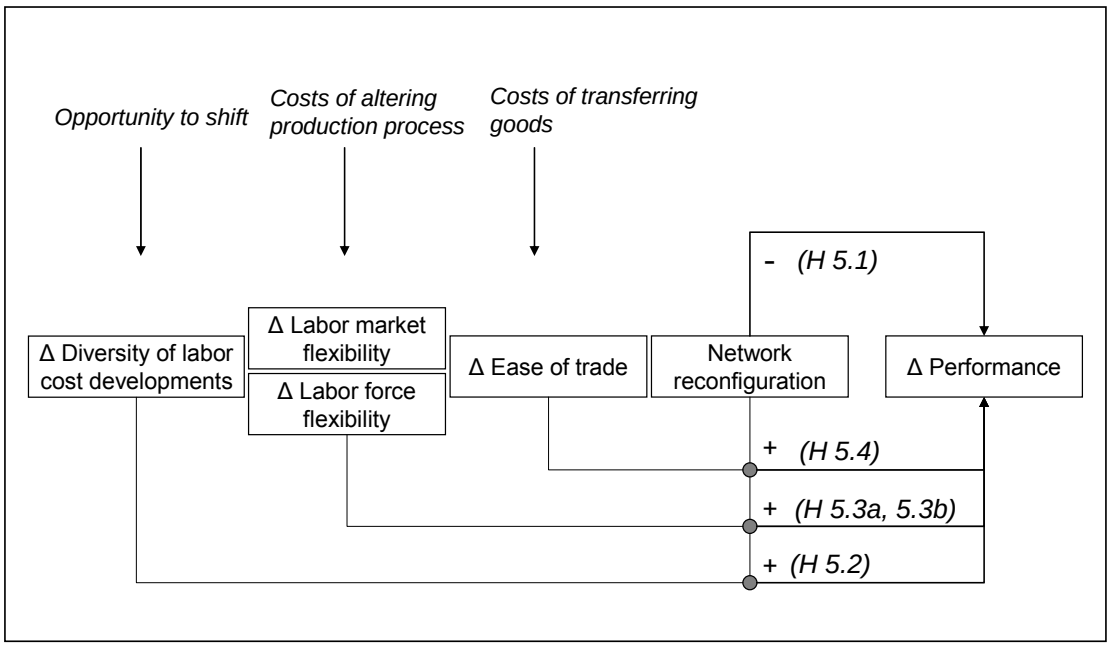
from a more versatile workforce within the network.

*Hypothesis 5.3b: The more an international production network is reconfigured, the more firms will benefit from increased flexibility of labor force within the network in the short-run.*

Altering production processes across foreign locations due to changed cost conditions creates a high intrafirm flows of goods. Raw materials and preliminary goods have to be transferred to the locations of the production system where they are needed for further processing; finished products have to be transferred from countries where they have been manufactured to countries where the customers are. Besides costs of transportation, trade across borders creates costs due to tariffs and bureaucratic hurdles at borders (World Bank, 2009). The overall costs associated with importing or exporting goods differ across countries, even with the rising emergence of tariff agreements between countries, because of different regulations concerning required documents and procedures when goods pass the national border. We expect that the more the network is restructured, the more firms can benefit from lower costs of trading across borders. Figure 5.1 summarizes the proposed influences of the five hypotheses.

*Hypothesis 5.4: The more an international production network is reconfigured, the more firms will benefit from increased ease of trade within the network in the short-run.*

Figure 5.1: Illustration of hypotheses on performance effects of network reconfiguration




## 5.3 Empirical methods

### 5.3.1 Data

We test the hypotheses on firm-level data of German MNCs. The Central Bank of Germany maintains a database that comprises anonymous information about all foreign direct investment objects of German parent firms above a balance sheet total of € 3 million. The reports include balance sheets, the stock of foreign direct investment and other characteristics of the foreign affiliates and parent firm. They are available as panel data on an annual basis. For this study, we use definitive figures between 2002 and 2006 and preliminary figures from 2007. Besides firm-level data, we included country-level data of the World Bank, the International Labour Organization (ILO), and the World Economic Forum.

Since investors and investment objects are classified by industry codes, we are able to filter out the production affiliates of the parent firms. Because of transportation and coordination costs, a high physical distance will impede a firm's exploitation of the potential of production shifting (Rugman & Verbeke, 2004). In common with existing research on capacity adjustments within an international network of subsidiaries (Belderbos & Zou, 2007), we limit the analysis of production affiliates to one geographical region. We center on Europe as production location since it is the most relevant target region of German foreign direct investment, accounting for 56 % of the foreign production. The second reason that makes Europe an appropriate empirical environment is that MNCs evaluate factor costs in the currency of their home country, while exchange rate fluctuations superimpose international factor cost movements. In European production networks, exchange rate fluctuations play a minor role due to the strong influence of the euro as common currency (European Central Bank, 2007).

The panel consists of 631 parent firms that are under observation for at least two consecutive years, and on average for 3.96 years (2498 firm years). Since international production shifting requires at least one alternative location, we incorporated investors only that maintain production affiliates in two foreign markets as a minimum. We excluded affiliates that reported zero employees or sales and outliers with a return on sales below -1000 % or above 1000 %. After aggregation of all production affiliates an investor holds in a country, we track restructuring decisions by identifying host country entries and exits of a firm in an individual year. Country entries were defined if a new country appears in the portfolio and stays in it for at least one subsequent year. Country exits are assumed to occur when a country is not in the firm's portfolio anymore in the subsequent year. Table 5.1 gives a breakdown of the number of entries

and exits that occurred in the observation period. All numbers referring to less than four observations are concealed due to confidentiality.

Table 5.1: Number of entries and exits per host country

| Country | Number of entries | Number of exits |
|---|---|---|
| Austria | 37 | 58 |
| Belgium | 39 | 36 |
| Bulgaria | 7 | 5 |
| Czech Republic | 54 | 42 |
| Denmark | 5 | 12 |
| Estonia | < 4 | < 4 |
| Finland | 13 | 10 |
| France | 76 | 93 |
| Greece | 5 | 7 |
| Hungary | 37 | 38 |
| Ireland | 12 | 14 |
| Italy | 57 | 78 |
| Kazakhstan | 5 | < 4 |
| Latvia | < 4 | < 4 |
| Moldova | < 4 | < 4 |
| Netherlands | 33 | 44 |
| Norway | 14 | 11 |
| Portugal | 19 | 23 |
| Russian Federation | 30 | 11 |
| Slovak Republic | 24 | 18 |
| Spain | 49 | 78 |
| Sweden | 24 | 19 |
| Switzerland | 28 | 33 |
| Turkey | 28 | 17 |
| Ukraine | 9 | < 4 |
| United Kingdom | 59 | 77 |
| Total | 666 | 731 |

### 5.3.2 Measures

*Dependent variable*

The profitability effect of restructuring decisions within the international production network is measured by figures that are specific to that network. As return on sales is a commonly used indicator of profitability in international business research (Capar & Kotabe, 2003; Li, 2001; Qian, Li, Li, & Qian, 2008), we calculate the joint return

on sales over all foreign production affiliates of an MNC in a year and subtract the return on sales of the previous year as measure of *change in performance*.

*Independent variables*

To separate performance effects that stem from a country-specific evolution of the factors that impact the flexibility of production shifting from those that evolve from restructuring the international network, we build interaction terms that link restructuring decisions to the change in the particular network properties. The variable *network reconfiguration* sizes the extent of restructuring the international network through host country entries and exits relative to the size of the international network (as number of host countries) in a particular year. The variables *network expansion* and *network contraction* capture the relative extent of network restructuring regarding host country entries and exits separately.

The variable *change in diversity of labor costs* shall reflect changes of heterogeneity of labor cost developments within the production network. Labor cost developments in foreign locations were taken from ILO's Key Indicators of the Labour Market (KILM) databank, 6$^{th}$ edition (2009). We use the real manufacturing wage index as a basis, which is the nominal wages index corrected for changes in purchasing power measured by the consumer price index (100 * nominal wage index/consumer price index). We subtract the wage index of the previous year from the wage index of the present year to obtain annual growth rates. We then calculate the variance in real manufacturing wage growth rates across the respective set of host countries in a year and subtract the variance of the previous year. Positive values indicate that the heterogeneity of labor cost developments has become higher.

The World Bank publishes the annual survey "Doing Business" that reports on business regulations and the protection of property rights as well as their effects on businesses in 183 economies (World Bank, 2009). The data are useful for foreign investors to evaluate countries as investment targets and are often employed as indicators in empirical studies (e.g., Atanassov & Kim, 2009; Botero et al., 2004). In particular, the reports include information on national labor market regulations, which are provided by local lawyers and public officials in each country. We draw on the "employing workers" index which captures regulations concerning hiring workers, working time, and dismissing employees. In order to obtain a measure of flexibility, we inverted the figures of each country and year and subtracted the average value across the locations of the network of the previous year from the current year in order to measure *change in flexibility of labor market*.

The versatility of the workforce is specific in particular foreign locations. Whereas firms may employ trainings and working routines across their foreign affiliates, the ability of the employees to adapt to changing requirements in the production process is contingent on the quality of the educational and vocational training system in a country (Pull, 2008). As in extant research (Geishecker, Goerg, & Munch, 2010; Herrmann, 2008), we draw on the yearly gross tertiary enrollment rates (source: World Economic Forum) to account for the quality of the educational system of a country. We calculated the average over the foreign locations of an MNC and subtracted the value of the previous year to obtain the variable *change in flexibility of labor force.*

In the European setting, tariffs or import restrictions as sources for costs of trading across borders are of minor importance due to the common market. However, the

costs for documents, administrative fees for customs clearance and technical control, terminal handling charges, and domestic transport differ considerably across the European countries (e. g. Belgium being twice as costly as Finland). We draw on figures from "Doing Business" surveys of the World Bank to account for those costs. Taking the mean costs that are associated with import and export of a 20-foot container in U.S. dollars, we calculated the average inverted costs across all locations in a year and subtracted the average inverted costs of the previous year to obtain the variable *change in ease of trade.* Positive values indicate that the transfer of goods across the locations of a network has become less costly whereas negative values point to higher costs of trading.

*Control variables*

Changes in performance from one year to the next may also occur due to productivity changes within the production network. We control for *change in productivity* by the sales of the network's subsidiaries relative to the number of employees. Further, we draw again on ILO's real manufacturing wage index as a basis for calculating wage growth rates in each foreign location before we compute the mean across all production locations in a particular year and subtract the mean for the previous year to control for *change in wage growth.* Time dummies control for overall external effects in the individual years of observation. Table 5.2 summarizes the measurement and descriptive statistics of the employed variables. All minimum and maximum values of firm-level variables refer to the average of highest and lowest three observations due to confidentiality policies.

Table 5.2: Variables measurement and descriptive statistics

| Name | Description | Mean | StdDev | Min | Max |
|---|---|---|---|---|---|
| *change in performance* | (Return on sales across foreign locations)$_t$ - (return on sales across foreign locations)$_{t-1}$ | -9.22E-6 | 0.15 | -2.05 | 1.63 |
| *network reconfiguration* | Number of exits and entries / number of countries | 0.11 | 0.23 | 0 | 1 |
| *network expansion* | Number of entries / number of countries | 0.04 | 0.12 | 0 | 0.78 |
| *network contraction* | Number of exits / number of countries | 0.07 | 0.20 | 0 | 1 |
| *change in ease of trade* | (Inverted average costs of importing and exporting across foreign locations)$_t$ - (inverted average costs of importing and exporting across foreign locations)$_{t-1}$ | -13.15 | 85.17 | -682.8 | 627.9 |
| *change in flexibility of labor force* | (Average tertiary enrollment rate across foreign locations)$_t$ - (average tertiary enrollment rate across foreign locations)$_{t-1}$ | 2.09 | 3.85 | -15.80 | 26.85 |
| *change in flexibility of labor market* | (Average inverted “Employing workers” index across foreign locations)$_t$ - (average inverted “Employing workers” index across foreign locations)$_{t-1}$ | -0.11 | 3.74 | -22.83 | 24.50 |
| *change in diversity of labor costs* | (Variance of labor cost developments across foreign locations)$_t$ - (variance of labor cost developments across foreign locations)$_{t-1}$ | 96.49 | 306.1 | -1539 | 3330 |
| *change in productivity* | (Sales in foreign locations / number of employees in foreign locations)$_t$ - (sales in foreign locations / number of employees in foreign locations)$_{t-1}$ | 12.55 | 108.1 | -1354 | 1450 |
| *change in wage growth* | (Average wage growth across foreign locations)$_t$ - (average wage growth across foreign locations)$_{t-1}$ | 0.77 | 5.39 | -30.90 | 41.44 |

Number of observations: 2498

To analyse our data, we employ an econometric panel technique. In the last decades, there has been increasing economic and financial integration of countries and financial entities, which imply strong interdependencies between cross-sectional units. Firms are likely to respond similarly due to unobserved components such as common social norms, neighborhood effects, or herd behavior (De Hoyos & Sarafidis, 2006). A growing body of literature concludes that panel-data models are likely to exhibit substantial cross-sectional dependence in the errors (e.g., Baltagi, 2005), which leads to rejection of the assumption of independent and identically distributed (i.i.d.)

error terms. We performed the cross-sectional dependence test developed by Pesaran (2004) and found that the null hypothesis of no cross-sectional dependence is strongly rejected. Further a Breusch-Pagan/Cook-Weisberg test (Breusch & Pagan, 1979; Cook & Weisberg, 1983) indicated the existence of heteroskedasticity of error terms. We therefore use a Prais-Winsten feasible generalized least squares (FGLS) estimation that allows for panel-specific autocorrelation as well as heteroskedastic and contemporaneously correlated disturbances across panels (Wooldridge, 2003).

## 5.4 Results

The correlation matrix in Table 5.3 reveals that the variables are largely independent of each other. The variance inflation factors are close to one (mean: 1.09) indicating low levels of multicollinearity.

Table 5.4 presents the regression results. Model 1 is the base model; none of the control variables reveals a significant coefficient, suggesting that they do not exert an impact on *change in performance*. As for the four variables that account for changes of factors that impact the flexibility of production shifting, their developments from one year to the other do not seem to impact performance changes, except in the case of *change in flexibility of labor market*, which reveals positive performance effects. Since not all firms exploit the flexibility potential of their international production network, improved flexibility characteristics seem not to have positive performance outcomes *per se*. Rather, only firms that do exploit the potential of production shifting, which might be identified by the motivation to improve the flexibility through network reconfiguration, are likely to benefit from better conditions for shifting production capacities.

Table 5.3: Correlation matrix and variance inflation factors

| | Variable | *1* | *2* | *3* | *4* | *5* | *6* | *7* | *8* | VIF |
|---|---|---|---|---|---|---|---|---|---|---|
| *1* | *change in performance* | 1 | | | | | | | | |
| *2* | *network reconfiguration* | -0.05 | 1 | | | | | | | 1.01 |
| *3* | *change in ease of trade* | -0.01 | 0.04 | 1 | | | | | | 1.09 |
| *4* | *change in flexibility of labor force* | 0.01 | 0.03 | 0.06 | 1 | | | | | 1.11 |
| *5* | *change in flexibility of labor market* | 0.06 | -0.03 | 0.03 | -0.19 | 1 | | | | 1.04 |
| *6* | *change in diversity of labor costs* | -0.01 | -0.03 | -0.13 | 0.07 | -0.03 | 1 | | | 1.11 |
| *7* | *change in productivity* | 0.02 | -0.04 | -0.03 | -0.01 | 0.01 | -0.01 | 1 | | 1.00 |
| *8* | *change in wage growth* | -0.02 | -0.02 | -0.28 | -0.22 | 0.05 | 0.28 | 0.00 | 1 | 1.24 |

Number of observations: 2498

The model variables are introduced throughout Models 2 to 6 in a stepwise manner. The variable *network reconfiguration* has a negative and highly significant coefficient (Model 2), which delivers support for our first hypothesis. It indicates that the more the network configuration is altered in relation to the network size, the higher will be the costs, leading immediately to a decrease of performance within in the portfolio.

Table 5.4: Prais Winsten regression on performance effects of network reconfiguration

| *change in performance* | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 | Model 7 |
|---|---|---|---|---|---|---|---|
| *network reconfiguration X change in ease of trade* | | | | | | 0.0003*** (0.0001) | 0.0003** (0.0001) |
| *network reconfiguration X change in flexibility of labor force* | | | | | 0.0089*** (0.0027) | | 0.0076*** (0.0027) |
| *network reconfiguration X change in flexibility of labor market* | | | | 0.0003 (0.0025) | | | 0.0012 (0.0026) |
| *network reconfiguration X change in diversity of labor costs* | | | 0.0002*** (0.0001) | | | | 0.0002*** (0.0001) |
| *network reconfiguration* | | -0.0430*** (0.0127) | -0.0391*** (0.0123) | -0.0428*** (0.0128) | -0.0432*** (0.0127) | -0.0452*** (0.0129) | -0.0414*** (0.0125) |
| *change in ease of trade* | -7.27E-7 (2.92E-5) | -7.41E-6 (2.92E-5) | 8.70E-6 (2.89E-5) | -7.56E-6 (2.92E-5) | -9.96E-6 (2.86E-5) | -3.95E-5 (2.86E-5) | -3.41E-5 (2.84E-5) |
| *change in flexibility of labor force* | 0.0010 (0.0008) | 0.0009 (0.0008) | 0.0009 (0.0008) | 0.0008 (0.0008) | -0.0001 (0.0007) | 0.0008 (0.0008) | -9.95E-5 (0.0007) |
| *change in flexibility of labor market* | 0.0014** (0.0007) | 0.0014** (0.0007) | 0.0016** (0.0007) | 0.0013* (0.0008) | 0.0016** (0.0007) | 0.0014* (0.0007) | 0.0015* (0.0008) |
| *change in diversity of labor costs* | 1.92E-6 (6.47E-6) | 2.66E-6 (6.48E-6) | 1.03E-5 (7.84E-6) | 2.59E-6 (6.46E-6) | 2.66E-6 (6.34E-6) | 6.72E-7 (6.56E-6) | 8.35E-6 (7.83E-6) |
| *change in productivity* | 1.26E-5 (1.62E-5) | 6.49E-6 (1.62E-5) | 7.00E-6 (1.62E-5) | 6.28E-6 (1.62E-5) | 1.02E-5 (1.63E-5) | 5.37E-6 (1.64E-5) | 8.13E-6 (1.63E-5) |
| *change in wage growth* | -0.0002 (0.0005) | -0.0003 (0.0005) | -2.73E-5 (0.0005) | -0.0003 (0.0005) | -0.0001 (0.0005) | -0.0001 (0.0005) | 0.0002 (0.0005) |
| Wald $Chi^2$ | 22.38** | 32.51*** | 37.32*** | 33.10*** | 39.11*** | 34.35*** | 42.60*** |
| Objects | 631 | 631 | 631 | 631 | 631 | 631 | 631 |

Estimation with time dummies; *** p < 0.01; ** p < 0.05; * p < 0.1; Standard errors in parentheses

By building an interaction term of *network reconfiguration* and the individual variables that account for changes in the different factors influencing the efficiency of production shifting, we can ascribe the impact of changes of those factors to restructuring decisions. For interaction, the variables were centered around zero. Model 3 reveals support for *Hypothesis 5.2* since the coefficient of the interaction

term of *network reconfiguration* and *change in diversity of labor costs* is positive and significant. The more the international production network is restructured, the more increased diversity of labor costs leads to opportunities for production shifting and increases the performance of the international activities. Model 4 introduces the interaction term of *network reconfiguration* and *change in flexibility of labor market.* Since it is insignificant, we do not find support for *Hypothesis 5.3a.* Restructuring decisions that create lower average costs for quantitative adjustments in the production process do not seem to outweigh the costs of reconfiguration in the short-run. *Hypothesis 5.3b* is supported, as the significant and positive coefficient of the interaction of *network reconfiguration* and *change in flexibility of labor force* in Model 5 indicates. The more the international configuration is altered, the more firms can benefit from lower costs of qualitative adjustments within the production process. Model 6 tests *Hypothesis 5.4* by introducing the interaction of *network reconfiguration* and *change in ease of trade*. The significant and positive coefficient supports the notion that decreased average costs of transferring goods across borders due to network reconfiguration lead to more efficiency of production shifting. Model 7 represents the full model, comprising all hypothesized performance effects of restructuring decisions and reveals that the results remain stable when the variables are tested together.

As a second step, we want to clarify whether the hypothesized performance effects of restructuring decisions are different when decisions of network expansion and contraction are considered separately. Tables 5.5 and 5.6 present regressions analogue to Table 5.4. In Table 5.5, *network expansion* is incorporated as a variable which indicates the extent to which the network has been enlarged by entering one or more new host countries. Again, the coefficients of the control variables are insignificant.

*Network expansion* has a significant negative coefficient (Model 8) which indicates that the more the network is enlarged in relation to its size, the lower will be performance within the network in the short-run. Hence, *Hypothesis 5.1* is also supported when only host country entries are considered.

Table 5.5: Prais Winsten regression on performance effects of network expansion

| *change in performance* | Model 8 | Model 9 | Model 10 | Model 11 | Model 12 | Model 13 |
|---|---|---|---|---|---|---|
| *network expansion X change in ease of trade* | | | | | 0.0002* (0.0001) | 0.0001 (0.0001) |
| *network expansion X change in flexibility of labor force* | | | | 0.0091*** (0.0028) | | 0.0096*** (0.0030) |
| *network expansion X change in flexibility of labor market* | | | 0.0016 (0.0026) | | | 0.0036 (0.0029) |
| *network expansion X change in diversity of labor costs* | | 0.0002** (0.0001) | | | | 0.0002** (0.0001) |
| *network expansion* | -0.0673*** (0.0220) | -0.0701*** (0.0218) | -0.0664*** (0.0221) | -0.0794*** (0.0219) | -0.0826*** (0.0221) | -0.0706*** (0.0216) |
| *change in ease of trade* | 2.58E-6 (2.88E-5) | 3.91E-5 (2.87E-5) | 2.73E-6 (2.87E-5) | 4.29E-06 (2.91E-5) | -1.68E-06 (3.01E-5) | -4.73E-6 (3.10E-5) |
| *change in flexibility of labor force* | 0.0011 (0.0008) | 0.0005 (0.0008) | 0.0011 (0.0008) | -0.0001 (0.0008) | 0.0005 (0.0008) | -0.0002 (0.0008) |
| *change in flexibility of labor market* | 0.0014* (0.0007) | 0.0013* (0.0007) | 0.0011 (0.0009) | 0.0016** (0.0007) | 0.0013* (0.0007) | 0.0010 (0.0009) |
| *change in diversity of labor costs* | 8.83E-7 (6.56E-6) | 3.79E-6 (6.77E-6) | 1.05E-6 (6.54E-6) | 1.80E-6 (6.47E-6) | 1.43E-6 (6.69E-6) | 2.12E-6 (6.57E-6) |
| *change in productivity* | 3.67E-6 (1.59E-5) | 2.77E-6 (1.62E-5) | 3.89E-6 (1.60E-5) | 6.55E-6 (1.59E-5) | 1.10E-6 (1.60E-5) | 7.09E-6 (1.59E-5) |
| *change in wage growth* | -0.0002 (0.0005) | -2.14E-5 (0.0005) | -0.0002 (0.0005) | -4.35E-5 (0.0005) | -8.68E-5 (0.0005) | 7.54E-5 (0.0005) |
| Wald $Chi^2$ | 34.46*** | 40.10*** | 35.09*** | 42.96*** | 38.15*** | 45.69*** |
| Objects | 631 | 631 | 631 | 631 | 631 | 631 |

Estimation with time dummies; *** p < 0.01; ** p < 0.05; * p < 0.1; Standard errors in parentheses

Corresponding to the effects of network reconfiguration, we also find support for *Hypothesis 5.2* (Model 9), *Hypothesis 5.3b* (Model 11), and *Hypothesis 5.4* (Model 12). *Hypothesis 5.3a* has to be rejected when only network expansion is considered only (Model 10). In the full model (Model 13) the effects remain mostly stable; however, the interaction of *network expansion* and *change in ease of trade* slightly loses its significance.

Table 5.6: Prais Winsten regression on performance effects of network contraction

| *change in performance* | Model 14 | Model 15 | Model 16 | Model 17 | Model 18 | Model 19 |
|---|---|---|---|---|---|---|
| *network contraction X change in ease of trade* | | | | | 0.0011*** (0.0003) | 0.0012*** (0.0004) |
| *network contraction X change in flexibility of labor force* | | | | 0.0080** (0.0040) | | 0.0018 (0.0049) |
| *network contraction X change in flexibility of labor market* | | | -0.0029 (0.0065) | | | -0.0050 (0.0070) |
| *network contraction X change in diversity of labor costs* | | 0.0002** (0.0001) | | | | 0.0002** (0.0001) |
| *network contraction* | -0.0258* (0.0142) | -0.0232* (0.0137) | -0.0258* (0.0146) | -0.0228 (0.0144) | -0.0342** (0.0151) | -0.0318** (0.0159) |
| *change in ease of trade* | 2.85E-6 (2.90E-5) | 4.38E-6 (2.84E-5) | -1.72E-6 (2.91E-5) | -4.58E-6 (2.89E-5) | 4.71E-5 (3.41E-5) | 4.48E-5 (3.53E-5) |
| *change in flexibility of labor force* | 0.0009 (0.0008) | 0.0009 (0.0008) | 0.0009 (0.0008) | 0.0011 (0.0008) | 0.0007 (0.0008) | 0.0004 (0.0009) |
| *change in flexibility of labor market* | 0.0014* (0.0007) | 0.0015** (0.0007) | 0.0013* (0.0007) | 0.0014* (0.0007) | 0.0012* (0.0007) | 0.0012* (0.0007) |
| *change in diversity of labor costs* | 2.33E-6 (6.51E-6) | 7.88E-6 (7.79E-6) | 1.96E-6 (6.38E-6) | 2.13E-6 (6.50E-6) | 2.43E-6 (6.53E-6) | 6.65E-6 (7.74E-6) |
| *change in productivity* | 1.15E-5 (1.62E-5) | 1.23E-5 (1.62E-5) | 1.21E-5 (1.60E-5) | 1.03E-5 (1.62E-5) | 1.07E-5 (1.64E-5) | 1.23E-5 (1.60E-5) |
| *change in wage growth* | -0.0002 (0.0005) | -0.0001 (0.0005) | -0.0002 (0.0005) | -0.0002 (0.0005) | -0.0002 (0.0005) | 0.0003 (0.0005) |
| Wald $Chi^2$ | 23.71** | 25.66** | 23.84** | 25.99** | 29.89*** | 30.04** |
| Objects | 631 | 631 | 631 | 631 | 631 | 631 |

Estimation with time dummies; *** p < 0.01; ** p < 0.05; * p < 0.1; Standard errors in parentheses

The results of the regression on changes in performance when only decisions of network contraction are considered are congruent to those of the two preceding regressions (Table 5.6): *Hypothesis 5.1* is supported as the negative and significant coefficient of *network contraction* reveals (Model 14). The more the network configuration is altered through leaving host countries, the lower will be the performance in the remaining locations. Further, we find again support for *Hypothesis 5.2* (Model 15), *Hypothesis 5.3b* (Model 17), and *Hypothesis 5.4* (Model 18), whereas *Hypothesis 5.3a* has to be rejected (Model 16). In the full model (Model 19), however, the interaction of *network contraction* and *change in flexibility of labor force* loses significance.

## 5.5 Discussion

The results of this chapter suggest that a reconfiguration of international production networks can increase performance of a firm's international activities in the short-run. Whereas the costs of restructuring decisions rise with the extent of reconfiguration and decrease performance, a higher flexibility of international production shifting immediately outweighs the costs of restructuring. Flexibility to shift production capacity is determined by the opportunity to shift and by costs that occur when production processes are altered and goods transferred across borders. Our analysis revealed that country entries and exits that create a higher diversity of labor cost developments within a production network provide more opportunities to shift capacity. If restructuring induces higher average versatility of workforce and lower costs of importing and exporting goods, the costs of production shifting will be lower.

The results correspond to previous findings that stress the importance of operational flexibility as an influential factor of a firm's performance (Miller & Reuer, 1998; Pantzalis, 2001; Thomas & Eden, 2004). Earlier studies found that the stock market favors international network configurations with a high number of host countries rather than a concentration of activities in few foreign markets (Allen & Pantzalis, 1996; Lee & Makhija, 2009). Maximizing the number of foreign locations is assumed to offer more flexibility for shifting production capacities across borders. However, network characteristics that determine the flexibility of production shifting are influenced by factors that are volatile. Therefore, a multinational network of production locations has to be regularly revised and restructured in order to maintain operational flexibility.

This chapter models the conditions that influence the performance effects of restructuring decisions in the short-run. International portfolio restructuring changes routines within the firm and relationships with institutions and stakeholders outside the firm (Heugens & Schenk, 2004). This interruption causes costs and leads to an immediate decline in performance, regardless of the type of restructuring. Both, entering new or withdrawing existing locations interrupts established routines and relationships in an integrated network of subsidiaries. However, rearranging an international production network may enhance the flexibility to exploit international cost differentials. MNCs can benefit from restructuring even in the short-run when the conditions for production shifting will be improved.

Our empirical analysis adds to previous findings on performance effects of restructuring decisions. Whereas portfolio restructuring was found to enhance performance in the long-run (Bergh, 1998; Chang, 1996), it reveals no (Wu & Delios,

2009) or negative (Kang & Shivdasani, 1997) performance effects in the short-run. Insights into the financial consequences of portfolio restructuring through adding new or withdrawing existing foreign production locations were missing until now. Further, our findings reveal that MNCs, that obtain more flexibility through restructuring, can immediately benefit from an international network reconfiguration. A higher diversity of labor cost developments was found to provide more opportunities for shifting capacity, which complements previous findings concerning the impact of diversity of exchange rate movements within an international network (Belderbos & Zou, 2009; Chung et al., 2010). Since production networks exert specific costs for exploiting operational flexibility (Buckley & Casson, 1998), changed average cost conditions of international production shifting determine the performance outcomes of restructuring. Lower costs of qualitative adjustments within the production process and of transferring goods across borders positively impact performance, when they emerge from restructuring decisions. Lower costs of quantitative adjustments, however, do not seem to outweigh the costs of restructuring in the short-run. The sub-analyses of restructuring decisions differentiating country entries and exits substantiate these empirical findings.

These results have important implications for investors who maintain an international production network and have to decide on restructuring it in order to enhance the benefits of operational flexibility. Long-term oriented restructuring decisions were found to have positive performance effects even in the short-run. Therefore, investors should not hesitate to restructure their international production network. The costs associated with restructuring, that may deter investors from entering new or withdrawing existing locations, can be immediately offset by the benefits of a higher flexibility. When evaluating countries as candidates for entry or exit, however, their

distinct fit within the existing portfolio should be considered. While absolute labor costs are an important factor in international in- and divestment decisions in general, their developments compared to the other locations of a network are decisive in obtaining positive performance effects of restructuring in the short-run. Other location characteristics, that immediately cause performance improvements of restructuring, are the versatility of workforce to cope with changing demands of altered manufacturing processes and the flexibility to transfer goods across the different sites of the network. An improvement of the average flexibility to quantitatively adjust production capacity, however, was not found to become performance effective in the moment of reconfiguration.

The analysis also delivers useful implications for host country governments, which have an interest in attracting new and keeping existing foreign investors in the country. MNCs that maintain an international production network in order to exploit operational flexibility will restructure this network according to changing external conditions that impact the efficiency of production shifting. If entering or leaving countries enhances the average flexibility to shift production capacity within a network, performance will be improved. Since those performance improvements even appear in the short-run, it seems difficult for host country authorities to establish sustainable relations to foreign firms. Countries might aim at offering location-specific flexibility, for example, through a well-qualified workforce, which is determined by the quality of the educational and vocational training system, or through low regulatory obstacles to import and export to be attractive as production location for a foreign investor. However, those location-specific characteristics are always evaluated by the investor in relation to alternative locations. Changing external conditions in all potential foreign locations motivate firms to regularly revise their

international configuration and to withdraw countries from the portfolio that have been chosen as production location before. Host country authorities must be aware that an MNC's international location decision might be only of limited duration.

Furthermore, host country governments need to consider of the likelihood that each investor evaluates the country's appropriateness as a production location through its fit within the investor's existing set of locations. Efforts to influence cost and flexibility characteristics are ineffective if investors base their decision to enter or exit a host country on its influence to operational flexibility of the established network. Therefore, it seems difficult for a single local authority to determine in- and divestment decisions that are based on a foreign investor's multinational production configuration.

The limitations of the analysis have to be kept in mind, when transferring its findings into directions for management and host country authorities. The short-term performance effects of restructuring decisions are determined by a number of characteristics within the MNC, which we were not able to observe. Managerial skills and corporate culture are important determinants of the success of integrating new or divesting foreign production subsidiaries. Further, the type of investment will influence the performance effects of restructuring. Acquired affiliates were found to be more complex and expensive to integrate into the MNC than greenfield investments. The anonymous dataset, however, does not allow controlling for these factors.

Nevertheless, future international business research can build on the findings of the analysis to gain more insights on the performance outcomes of restructuring decisions that affect the efficiency of international production shifting. Studies building on

more fine-grained data sources such as management surveys may detect other factors that determine performance outcomes of restructuring an international production network. Furthermore, long-term performance effects and market-valuations of portfolio restructuring still have to be investigated. In the last chapter we will resume the findings of the preceding analyses of this study from an integrated perspective.

# 6. SUMMARIZING DISCUSSION

A network of foreign production affiliates endows firms with operational flexibility to shift capacity internationally due to changed external cost conditions. If the current configuration of a multinational production network reveals efficiency deficits, MNCs have to restructure their international activities in order to be able to manufacture their products at lowest costs. In this study, we identified factors that urge firms to improve the efficiency of their multinational network by establishing new foreign production locations or by withdrawing existing production locations from the portfolio. Restructuring decisions that lead to a higher flexibility of capacity shifting were found to have positive performance effects.

The results of this study deliver new insights into firms' international production strategies. They complement existing research that investigates the conditions under which MNCs make use of operational flexibility and studies that analyse the performance effects of possessing operational flexibility. Comprehensive insights on the effects of operational flexibility on international portfolio restructuring decisions were missing to date.

Our findings contain valuable implications for international investors. The study highlights a network perspective on international resource allocation decisions. Besides characteristics of the individual locations, that might be added to or abandoned from the portfolio, investors should consider their fit within a network of affiliates if they want to improve the efficiency of the international production system. Further, flexibility characteristics revealed to be as important factors as cost conditions for the efficiency of an international network. Firms that restructure their

multinational portfolio should account for the different flexibility aspects to the same extent as for current cost conditions in a location.

Host country governments may consider the findings of this study when trying to attract new firms or keep foreign investors in the country. Institutional conditions such as regulation of the labor market are important factors that determine the efficiency of international production shifting. Host countries that improve those conditions offer more flexibility for multinational firms to exploit the potential of operational flexibility and secure the relative attractiveness of a location. However, public authorities have to be aware that MNCs might base their in- and divestment decisions not only on characteristics of the single location but on properties of the network as a whole. In that case, incentives for investors to make (further) investments should be individualized for the respective firm. Moreover, host countries must consider that MNCs are flexible in their location decisions; concessions that have been made by firms can become obsolete when external conditions change. Investment incentives for particular firms or the improvement of national conditions to meet the requirements of firms that are searching for the most efficient production locations might meet with only temporary success. Rather, the constant competition for foreign direct investment among national states can lead to an erosion of social institutions, e. g. on national labor markets. To preserve national interests, host country governments should think about trans-nationally agreed regulations that allow minimum standards regarding different legal business conditions.

Future international business research can build on the findings of this study and overcome its limitations. Studies using more fine-grained data may detect an investor’s awareness of the flexibility potential underlying an international production

network and whether the international configuration technically allows capacity shifting as the different sites manufacture interchangeable outputs. Further, it has to be clarified to what extent managerial skills and organizational resources determine the exploitation and performance outcomes of operational flexibility within a firm. Subsequent studies may also advance the knowledge on allocation decisions based on operational flexibility by choosing empirical settings that are different from the European. Exchange rate movements are an important determinant of a multinational production network's operational flexibility when there is no common or dominant currency.

Our study revealed that the exploitation of international arbitrage and leverage opportunities is a main influencing factor of an MNC's international resource allocation decisions. Beyond the interests of a single firm or host country, which can take advantage of efficiency attempts, the overall social and political consequences of an MNC's exploitation of production flexibility have to be broadly discussed. Multinational firms that do not commit to corporate social responsibility guidelines may undermine social institutions through their bargaining power against national states. Those issues cannot be resolved by the discipline of international business research alone. Even though it is very difficult to meet the interests of every involved party, politics is required to debate potential solutions to counter MNCs that have become more powerful. As our study illustrated, MNCs act globally to achieve success. That is a strategy their negotiating partners from political side should adopt more consequently in order to strengthen their bargaining power.

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